Case Study on Direct Benefit Transfer (DBT) Scheme of India

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Introduction

Introduction

- In order to lift the backward sections of society and crisis affected families from poverty, the Government of India (GoI) has been facing some core problems in the distribution of funds.
- Two major problems in the transfer of benefits under govt schemes were:
  - Organizational structure of delivery of benefits to the concerned beneficiary.
  - Identity verification of the deserving beneficiary .
- Government of India (GoI) realized the urgent need of empowering the delivery mechanisms of govt schemes to ensure the right groups getting benefitted from the govt schemes.

Introduction

- Thus the portal of an innovative solution called the Direct Benefit Transfer (DBT) program was launched in the year 2013, for a more transparent and systematic delivery process of subsidiary schemes.
- Though the foundational objectives of DBT were to simplify the delivery process, its implementation has posed a couple of challenges in a vast, diverse and a country with complex top-down bureaucratic structure like India (discussed in the further slides).
- These hardships can be tackled by the government on completely utilizing the ecosystem of digitalization and social network connectivity provided by various branches of ICT.

02
Detailed problems before DBT

Detailed Problems before DBT

- Verification of beneficiary's identity

  Central & state govt authorities have faced the core time consuming challenge of identifying the right beneficiaries through the documents received. Large number of true beneficiaries have missed out many schemes due to the unavailability of few crucial documents and a lengthy process.

- Identity fraud committed by anti-social elements

  Incidents involving anti-social elements capturing govt schemes through bogus documents and records & identity theft have been reported in the past few years. It is the government's responsibility to track such criminals and punish them under the criminal acts.

Detailed Problems before DBT

- Multiple individuals involved in a linear process
  - Involving multiple functionaries between the govt and common-man made the process time expensive and costly.
  - The beneficiary had to visit a dozen of departments, taking appointments in a queue, carrying a bunch of documents only to know that it will take some more time to avail the benefits.
  - Government was lacking the forces and methods to control and curb institutional corruption at different levels .
  - Transparency was a big issue in govt related schemes.

03
Objectives of DBT

Objectives of DBT

- Through the National Committee on Direct Cash Transfer, the Government of India (GoI) desired to utilize the principles of digitalization for delivery of services to tackle the problems faced in the distribution of subsidies.
- The introduction of DBT was primarily aimed at eliminating corruption, better governance and identity record management of the beneficiaries .
- Through DBT, the actual beneficiaries would maximize the benefits and the nation can achieve overall human development owing to the economic measures.

Objectives of DBT

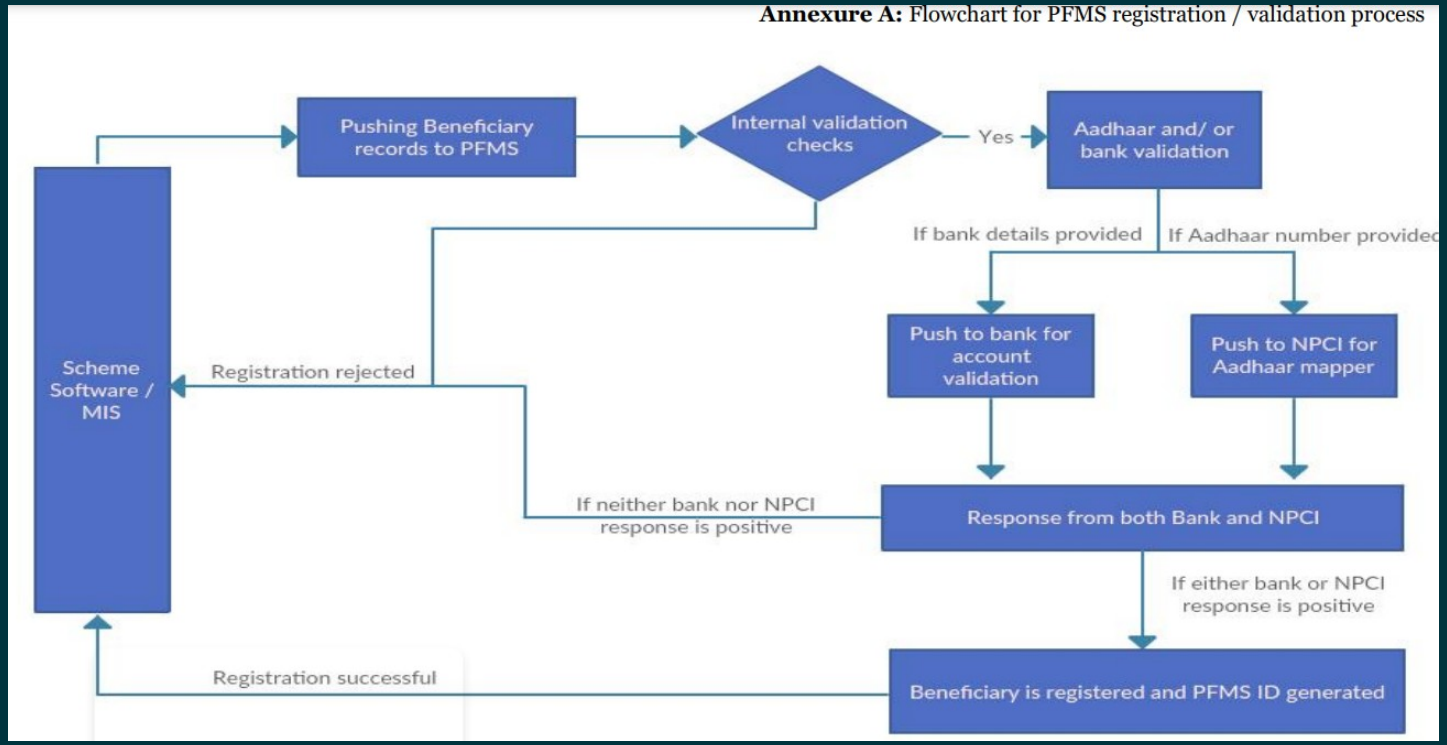
- Objectives of DBT currently include:
  - Identifying beneficiaries through their Aadhaar UIDs.
  - Directly crediting monetary benefits such as pensions, scholarships, etc. to the bank accounts of the beneficiaries.
  - Digital payment of subsidies under DBT through Public Financial Management System of the Government of India (GoI).
  - Ensuring timely delivery of benefits to deserving beneficiaries by preventing leakages in the delivery mechanism and causing significant reduction in cost of transactions .
  - Maintaining efficient, transparent and fast transfer of benefits.

04

Strategic Planning and programs for DBT

Strategic planning and programs for DBT

- Flowchart of PMFS registration / validation process under Annexure A of the SOPs provided for DBT scheme (source: dbtbharat.gov.in)



Strategic planning and programs for DBT

- The government created a task force of administrative correspondents of key ministries, to provide a systematic path for the execution of this strategy which was led by eminent personalities in technology all over India at that time in order to suggest a workable solution
- National Committee on Direct Cash Transfer was established on the 25th October, 2012 under the then PM of India Shri Manmohan Singh
- Digitalization of all the governmental procedures was at the center of strategies put forth by the Government of India (2009-14) for DBT, though it was aware of the challenges ahead such as non-availability of unique identity of beneficiaries, non-availability of access to banking and limited network connectivity in rural areas

Strategic planning and programs for DBT

- The Executive Committee assisted the National Committee & they both were supported by the committees: Financial Inclusion Committee, Technology Committee and Implementation Committee on electronic transfer of benefits
- The first phase of DBT, rolled out on 1st January 2013, was launched in 43 districts, covering scholarships and social security pensions
- With effect from 12th December 2014, it expanded across the nation. MGNREGA was also brought under DBT along with 34 other schemes
- The Central Plan Scheme Monitoring System (CPSMS), being implemented by the Office of Controller General of Accounts, acts as the common platform for routing DBT

Strategic planning and programs for DBT

- CPSMS is used for the preparation of the beneficiary list, digitally signing the same and processing of payments in the bank accounts of the beneficiary using the Aadhaar Payment Bridge
- The following programs are part of the DBT initiative:
  - National Child Labor Project
  - Student Scholarship
  - LPG subsidy
- There are total 313 schemes under DBT (as of March 27, 2022). Some of them include Pradhan Mantri Fasal Bima Yojana, National Food Security Mission, National Livestock Mission, Swachh Bharat Mission, Gramin Atal Pension Yojana, Ayushman Bharat & Khelo India

05
Achievements of DBT

Achievements of DBT

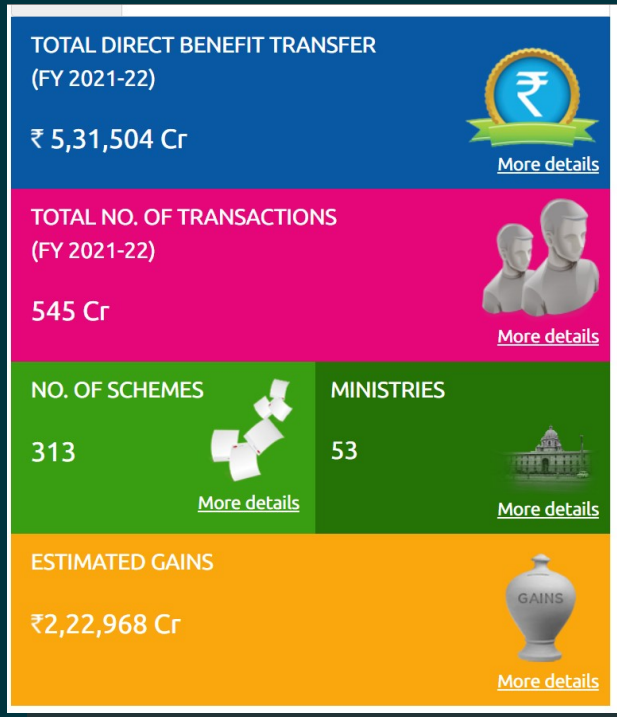
Source : dbtbharat.gov.in

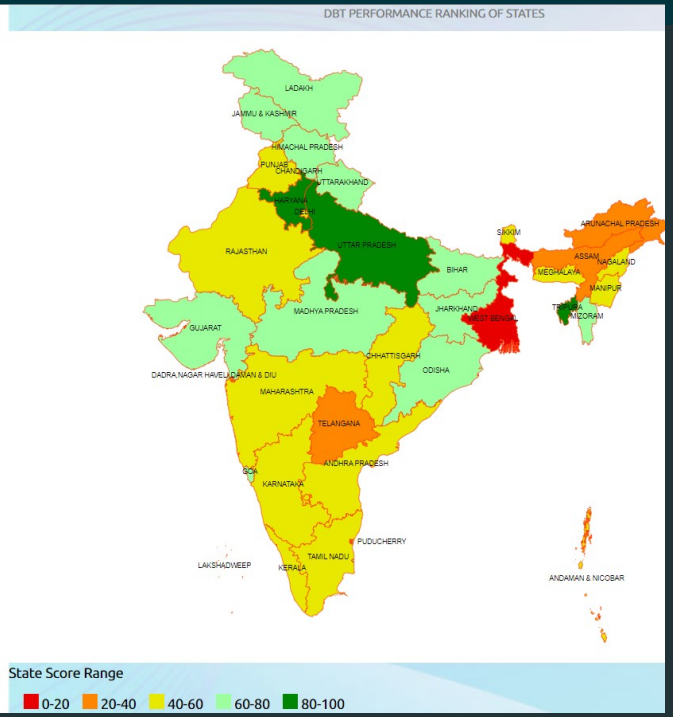
- Total DBT (2013-Present) = Rs. 21,69,256 Crores = $ 284.32 billion

Achievements of DBT

Source : dbtbharat.gov.in

- For FY 2021-22, $ 69.60 billion DBT was achieved with a total of 5.45 billion transactions and a savings of over $ 29.10 billion

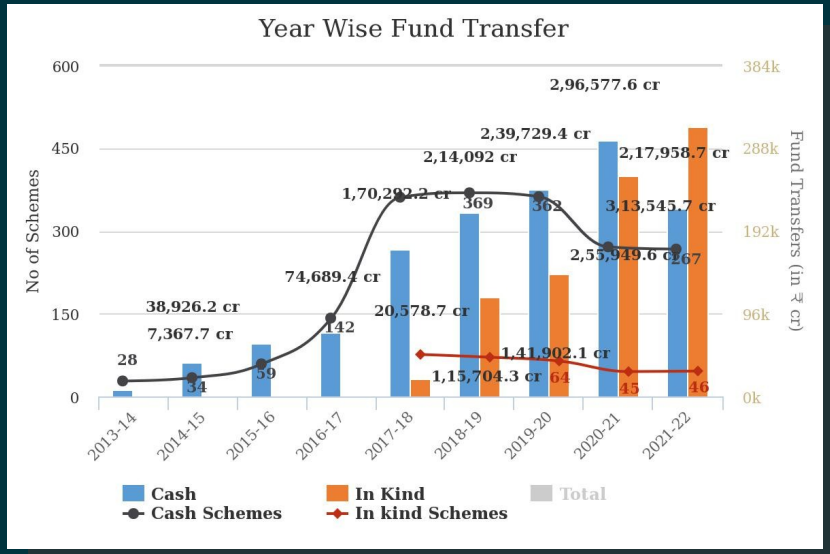


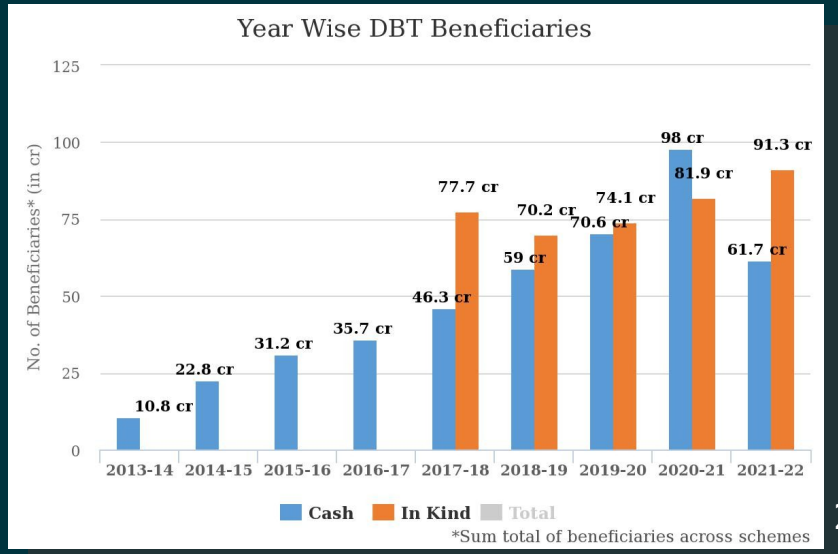


Achievements of DBT

Source : dbtbharat.gov.in

- In FY 2021-22, 913 million beneficiaries were delivered in kind services under DBT whereas 617 million beneficiaries received cash through DBT across various schemes
- Total DBT beneficiaries & fund transfer have increased over the years





Achievements of DBT

- DBT led the removal of duplicate / fake beneficiaries due to which the government could target the genuine and deserving beneficiaries
- Estimated savings / benefits from some of the Schemes are as under:

Source : dbtbharatgov.in

S.No	Ministry/ Department	Scheme	Estimated Savings / Benefits (in Rs. Cr)			Remarks
			Cumulative upto March 2020	April 2020 to March 2021	Cumulative upto March 2021	
1	Department of Fertilizers	FERTILIZER	10,000.00	0	10,000.00	Reduction of 120.88 Lakh Metric Tonnes of fertilizer sale to retailers.
2	Department of Rural Development	MGNREGS	25,672.36	7,803.11	33,475.47	Based on field studies Ministry has estimated 10% savings on wages on account of deletion of duplicate, fake/ non-existent, ineligible beneficiaries.
3	Department of Rural Development	NSAP	524.31	6.41	530.72	Deletion of 9.53 lakh duplicate, fake/ non-existent, ineligible beneficiaries (including some due to migration, death etc.).
4	Ministry of Women and Child Development	OTHERS	1,523.75	0	1,523.75	Reduction of 98.8 lakh duplicate, fake/non-existent beneficiaries.

5	OTHERS	OTHERS	1,120.69	35.86	1,156.55	
6	Ministry of Petroleum and Natural Gas	PAHAL	71,301.00	1,608.58	72,909.58	4.11 crore duplicate, fake/ non-existent, inactive LPG connections eliminated. In addition there are 1.79 crore Non-subsidized LPG consumers, including 1.08 crore 'Give It Up' consumers.
7	Department of Food and Public Distribution	PDS	66,896.87	34,700.00	1,01,596.87	Deletion of 3.99 crore duplicate and fake/ non-existent Ration Cards (since 2013 till 2020)
8	Ministry of Minority Affairs	SCHOLARSHIP SCHEME	1,022.15	417.82	1,439.97	Deletion of 21.62 lakh duplicate, fake/ non-existent beneficiaries.
9	Department of Social Justice and Empowerment	SCHOLARSHIP SCHEME	335.52	0	335.52	Deletion of 1.91 lakh duplicate, fake/non-existent beneficiaries.
Total			1,78,396.65	44,571.78	2,22,968.43	

06

Manoeuvre behind DBT’s success

Manoeuvre behind DBT's success

- Public Financial Management System (PFMS), which was started as the Central Planning Scheme Monitoring System (CPSMS) of the Planning Commission in 2008-09 fueled the development of required technical modules for DBT
- Outstanding support provided by the successive govt. Aadhaar, launched by the UPA govt has received a massive support from the successive NDA govt.
- Digital revolution of the 2010s connecting millions of citizens
- Structuring government policies for the promotion of DBT
- Involving multiple departments and ministries under DBT

Manoeuvre behind DBT's success

- Awareness programs and campaigns to reach out the rural and downtrodden population by the Ministry of Finance and Ministry of Rural development, etc. for use of Aadhaar in disbursement of benefits
- Linking of beneficiary's Aadhaar ID and financial details helping in tracking the right beneficiary and monitoring its finance
- Sophisticated Federal Database of Beneficiaries improvising the identity record management of the beneficiaries

07
Role of ICT in the project

Role of ICT in this project

- Information and communication technologies (ICT) plays a significant role in almost all aspects of the modern society
- It has changed the way in which we communicate with each other, how we find information, how we conduct business, interact with government agencies, and how we manage our social lives
- Citizens have been receiving additional opportunities and services as a result of ICTs
- ICT plays a magnificent role in CCTs or UCTs through network connectivity and bringing up the overall development of the world

Role of ICT in this project

- It has also developed social responsibility among the citizens and left a significant impact on elevating underprivileged classes of society by connecting them to people all around the world
- Almost all the government machineries today rely on ICT to transform government operations and services in order to meet citizens' expectations for better services
- Every department is working hard to improve government competence in order to satisfy people's needs and provide better services. The software application DBTMIS was conceived, developed and implemented with this aim in mind by the Planning Commission's local NIC unit for DBT.

08

Critical Analysis of DBT and conclusion

Critical Analysis of DBT

- Cash transfer schemes like DBT were rolled out in many nations before the 2010s such as Brazil (*'Bolsa Familia'*, world's largest & most successful CT scheme), USA, Mexico and many Latin American nations
- Policies of these nations have not intervened with market, but have moved along with market(1) whereas in Indian context the institutions have been a substitute for welfare schemes that the market has failed to deliver and the introduction of cash transfers is the replacement of the traditional in-kind transfer(2)
- Deployment of cash transfers for public provisions in the form of kind allocations may not be suitable for certain goals and is dependent highly on the context(3)

Critical Analysis of DBT

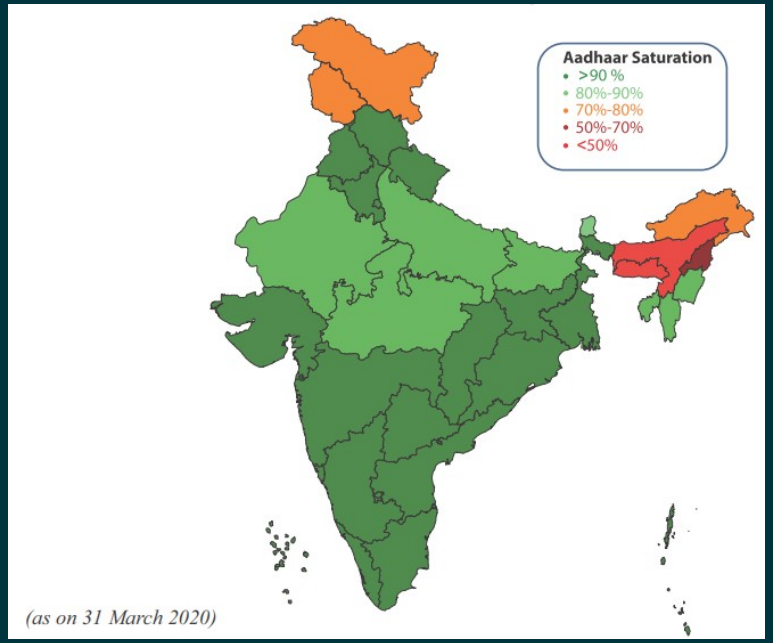
- Most of the nations have implemented Conditional Cash Transfer programs unlike Unconditional Cash Transfer (UCT) perceived in the economic survey 2010-11. It mentions, “Well targeted UCT can boost household consumption and asset ownership and reduce food security problems for the ultra-poor.”
- In Indian setting, the problem is not with the transmission of money but the conversion of money into desired outcomes
- Reports argue that the direct cash transfers designed is not in lieu with the attainment of forward and backward linkages and is not income generating as well[4]. CCTs are better measures when the intended outcome is building human capital[5].

Critical Analysis of DBT

- From the DBT Mission data, if it was 5.68 crore beneficiaries who were not holding Aadhaar in 2013, it's 8.36 crore beneficiaries who were not holding an Aadhaar to receive the DBT in 2017, as the beneficiaries of DBT scheme had been increased from 22.74 crores (2013) to 35.71 crores (2017).
- In 2013, 8.35 crore (36.7%) of beneficiaries were having an Aadhaar seeded bank account but if we check the data of 2017, it's evident that only 29.01% of fund is transferred through Aadhaar linked bridge payment system. So the scheme is yet to reach out to many by ways of providing Aadhaar, opening of bank account and simultaneously linking the unique identity with the bank accounts to find its success.

Critical Analysis of DBT

- Inter-state parity is yet to be achieved as the Aadhaar coverage was as little as 7.3% in Assam to as much as 116.7% in the capital, in 2017
- Even in 2020, states like Assam, Meghalaya & Nagaland were behind in terms of Aadhaar coverage



Picture Credits : UIDAI (https://uidai.gov.in)

Critical Analysis of DBT

- In the context of paradigms of financial inclusion, the basic function of the Bank is to accept deposits and grant loans. Hence moving to a Aadhaar Card enabled bank account for the transfer of cash and interest subventions should not take place at par with the necessary function of credit creation, which is more important than the former.
- On moving from subsidized schemes to the introduction of cash transfers, the beneficiaries will avail the benefits at market price. On the other hand, the sellers incur income; part of which will be saved for further spending. Thus the transformation from subsidies to cash will generate a series of secondary spending. If not met with the supply of necessitated demand, the central bank of the country will have to take up monetary tightening policy.

Critical Analysis of DBT

- This will prove to be dampening for the economy due to less investment prospects. Specifically, besides investors, others who will be affected are the poor people who fall in the margin.
- With inflationary pressures creeping in, and in the absence of BPL (Below Poverty Line) provision, they will face price hike and increased cost of living.

Conclusion

- The direct benefit transfer scheme is an evolving project of the government that it has to closely watch and scrutinize to track the accruing benefits and the cost
- As in the case of any scheme or project, the direct benefit transfer scheme comes with its own prospects and concerns
- A systematic appraisal of the costs and benefits is a mandate for the efficient functioning of the system
- Aadhaar Card and financial inclusion through opening up of bank account are the two pillars upon which DBT rests

09
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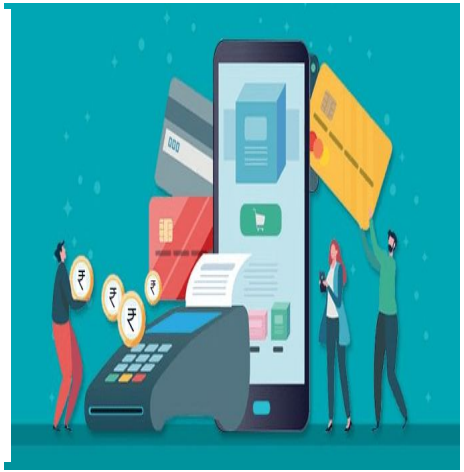
Digital India Revolution in Digital Payments in India



Digital India → Digital Payments

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What is Digital Revolution ?

What is Digital India ?

How has it impacted our life?

How has it contributed in Digital Payment ?

What are the benefits and drawbacks of digital payments ?

What is digital revolution ?

- The **Digital Revolution** (also known as the **Third Industrial Revolution**) is the shift from mechanical and analogue electronic technology to digital electronics which began in the latter half of the 20th century, with the adoption and proliferation of digital computers and digital record-keeping, that continues to the present day.

- Digital technology has enabled growth of the society and has touched people from all walks of life including fields such as education, science, technology, medicine, payments etc. It has revolutionized work practices.

What is digital India ?

- E-governance initiatives in India took a broader dimension in the mid 1990s.

- Digital India is **a flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy**, launched in 2015.

- It aims to **provide the much needed thrust to the nine pillars of growth areas**, namely

  Broadband Highways,
  Universal Access to Mobile Connectivity,
  Public Internet Access Programme
  e-Governance: Reforming Government through Technology,
  e-Kranti - Electronic Delivery of Services,
  Information for All
  Electronic Manufacturing,
  IT for Jobs
  Early Harvest Programmes

Digital India
Power To Empower

How has Digital India impacted our life :-

- Digital Facilities of Government
- Change in Global Market
- Online Labour
- E-commerce
- Investment Sector
- Technology Start-ups
- Digital Programmes
- Education System
- Health Sector
- Agriculture Sector

Digital Payments – an outcome of Digitalization

Over the last few centuries, and particularly in the last few decades, our methods of monetary exchange and payments have developed rapidly alongside technological innovation.

Digital technology has paved the way for digital payments.

Needless to say, we've come a long way from "bartering spices for sheep" to "digital payments".

What is Digital Payment?

A digital payment, sometimes called an electronic payment, is the transfer of value from one payment account to another using a digital device such as a mobile phone, POS (Point of Sales) computer, digital channel communications such as mobile wireless data.

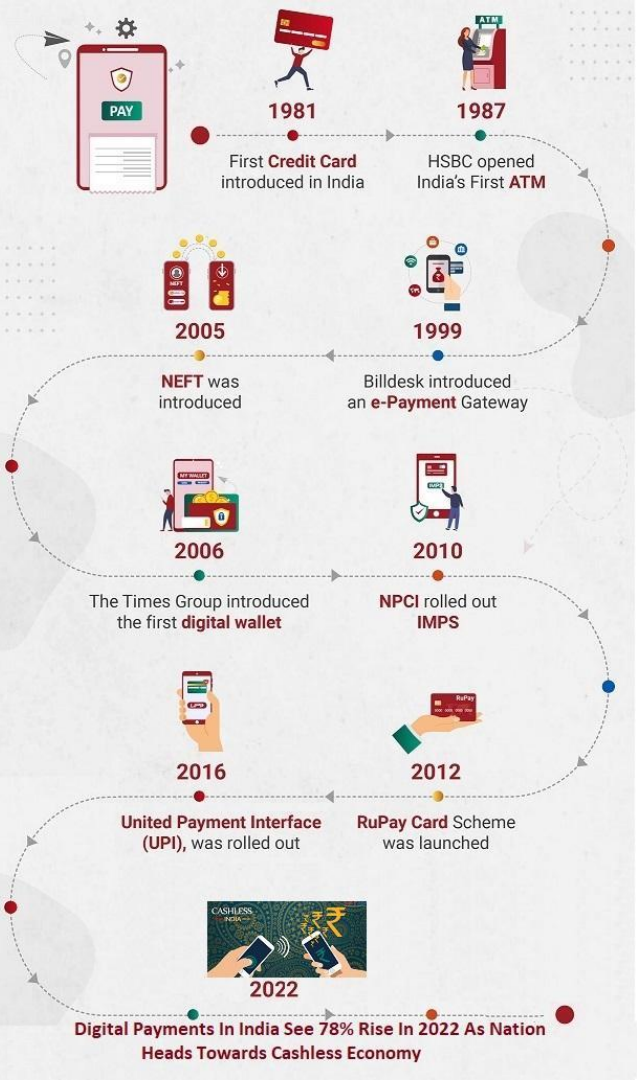
The definition includes payments made with bank transfers, mobile money and payment cards including credit, debit and prepaid cards.

Evolution of Digital Payment

In 1983, a research paper by David Chaum introduced the idea of digital cash.

In India, the last decade has witnessed an exponential increase in the adoption of digital payments by a large section of the population. This was driven by increased access to the internet & the mobile phone.

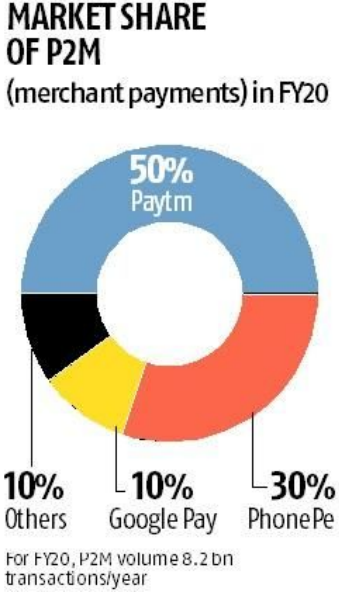
The value of digital payments in India will grow three-fold to touch $1 trillion by financial year 2026 compared to $300 billion in financial year 2021 thanks to the government's initiative to increase financial access by combining no-frill bank accounts, the Aadhaar card and mobile connection.

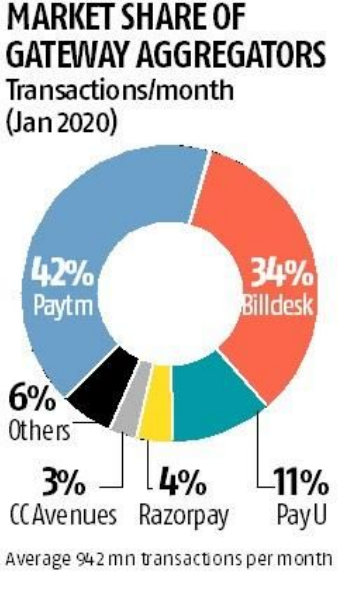


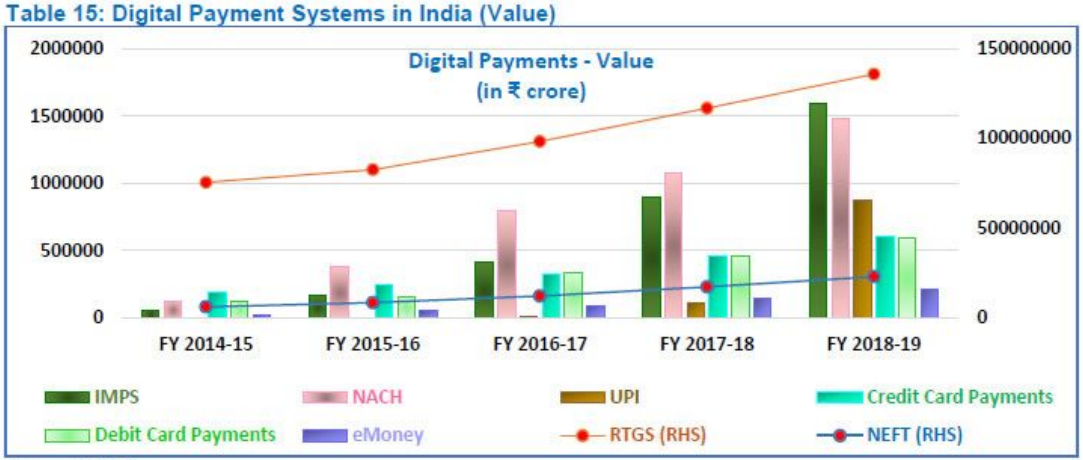
Enabled by IC(S)T…

INFORMATION:

1. Analysing historical data helps to innovate new Ideas and shape out scalable solutions.
2. User Demand, Competition within Industry, Better Recommendations, Cost Cutting Strategies are some of the examples of Payment Data Analytics.







Source: RBI Data

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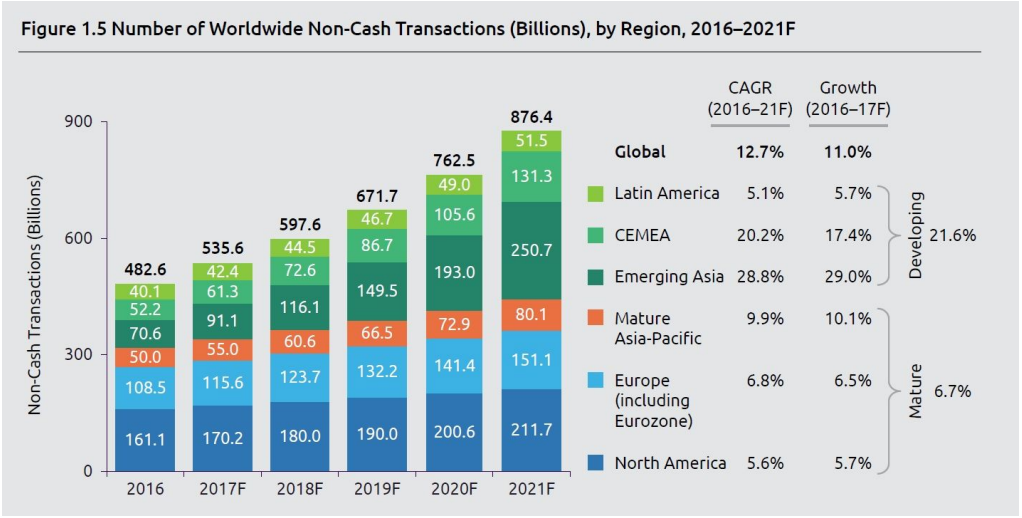
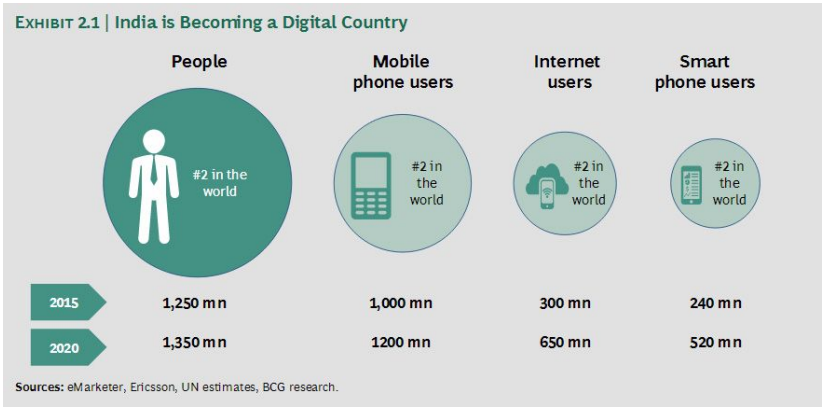
COMMUNICATION:

1. With the evolution of high speed internet, Digital Payments saw enormous growth.
2. Major Share of it is seen in developing countries.





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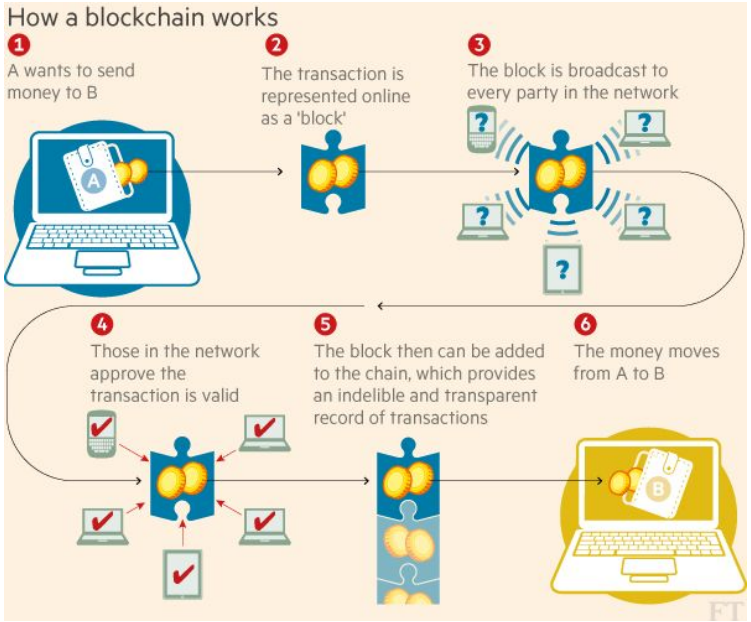
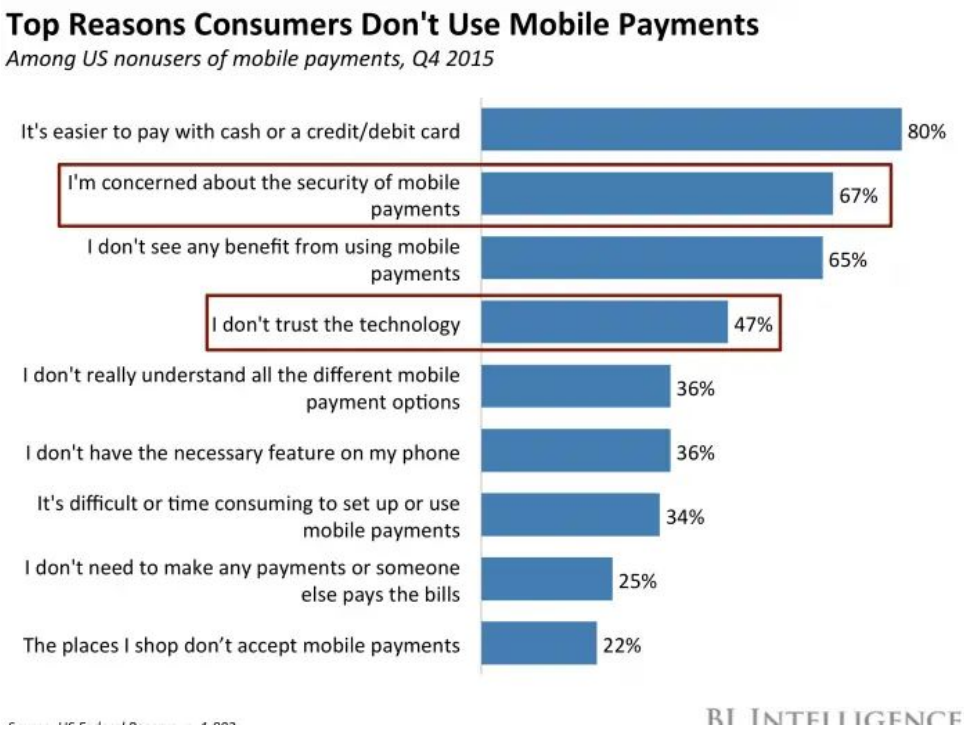




Types of Digital Payment

Digital payments can be partially digital, primarily digital, or fully digital.

A **partially digital payment** is one in which both payer and payee use cash via third party agents, with providers making digital bank transfers in the backend.

A **primarily digital payment** might be one in which the payer initiates the payment digitally to an agent who receives it digitally but the payee receives the payment in cash from that agent.

A **fully digital payment** is one in which payer initiates the payment digitally, also the payee receives the payment in digital form; without involving any cash transaction in between.

Modes of Digital Payment

Modes of Digital Payment

Banking cards –

✔ most widely used payment methods
✔ come with various features such as security of payments, convenience, etc.
✔ can be used to make other types of digital payments.
✔ Some of the most reputed card payment systems are Visa, Rupay and MasterCard.
✔can be used for online purchases, in digital payment apps, PoS machines, online transactions, etc.

How to get Banking cards?

✔Apply with your respective bank and provide Know Your Customer (KYC) details
✔The card will get activated within a week and you will be allotted a 4-digit pin, which can be used for all transactions

Modes of Digital Payment

Bank Pre-paid cards

✔This is a type of payment instrument on to which you load money to make purchases.

✔This type of card may not be linked to the bank account of the customer.

✔However, a debit card issued by the bank is linked with the bank account of the customer.

How to Use a Prepaid Card?

✔Apply for the card

✔Get pin

✔Load money from your bank account/debit card

Modes of Digital Payment

PoS terminals

✔a critical piece of a point of purchase, refers to the place where a customer executes the payment for goods or services.
✔Sales taxes become payable.
✔It is usually a hand held device that reads banking cards.
✔types of PoS terminals: Physical PoS, Mobile PoS and Virtual PoS.

✔Physical PoS terminals are the ones that are kept at shops and stores.
✔Mobile PoS terminals work through a tablet or smartphone.
✔Virtual PoS systems use web-based applications to process payments.

Modes of Digital Payment

Unified Payments Interface - UPI

✔ interoperable payment system through which any customer holding any bank account can send and receive money through a UPI-based app.

✔user can link more than one bank account on a UPI app on their smartphone

✔initiate fund transfers and make collect requests on a 24/7 basis and on all 365 days.

✔ enables users to transfer money without a bank account or IFSC code, only VPA should be known.

✔user should have a valid bank account and a registered mobile number, linked to the same bank account.

✔no transaction charges for using UPI.

✔UPI apps are available on both Android and iOS platforms.

How to use UPI?

✔Download the app on Android or iOS platform

✔Register for the service by providing bank account details

✔Create a VPA, get an MPIN

Modes of Digital Payment

Bharat Interface for Money (BHIM) app

✔This app allows users to make payments using the UPI application.

✔One can link his/her bank account with the BHIM interface easily. It is also possible to link multiple bank accounts.

✔The BHIM app can be used by anyone who has a mobile number, debit card and a valid bank account.

✔Money can be sent to different bank accounts, virtual addresses or to an Aadhaar number.

How to Use BHIM App?

✔Download and install the BHIM app

✔Choose a language

✔Register for the service by providing mobile number linked to bank account

✔Add bank-related information and set up a UPI PIN by following the given instructions

Modes of Digital Payment

Unstructured Supplementary Service Data - USSD

✔ *99# is used to carry out mobile transactions without downloading any app.
✔ can also be made with no mobile data facility.
✔facility is backed by the USSD along with the NPCI.
✔service can be used to initiate fund transfers, get a look at bank statements and make balance queries.
✔also available in Hindi.

How to Use *99#?

✔This service can be used by dialling *99#, after which the customer can interact with an interactive voice menu through their mobile screen.
✔To use the service the mobile number of the customer should be the same as the one linked to the bank account
✔The next step is to register for USSD, MMID (Mobile Number Identifier) and MPIN

Modes of Digital Payment

Aadhaar Enabled Payment System - AEPS

✔can be used for all types of banking transactions

✔transactions are carried out through a banking correspondent based on Aadhaar verification.

✔no need to physically visit a branch, provide debit or credit cards, or even make a signature on a document.

✔for availing the service, Aadhaar number must be registered with the bank where you hold an account.

How to use AEPS?

✔Register your Aadhaar number with the bank where you hold an account.

✔For transactions, provide the accurate Aadhaar number and the payment will be successfully made to the concerned merchant

Modes of Digital Payment

Mobile Wallets

✔a type of virtual wallet service that can be used by downloading an app.
✔It stores debit/credit card information or bank account information in an encoded format to allow secure payments.
✔One can also add money to a mobile wallet and use the same to make payments and purchase goods and services.
✔this eliminated the need to use credit/debit cards or remember the CVV or 4-digit pin.
✔mobile wallet apps in the market are paytm, mobikwik, freecharge etc.
✔these may charge a certain transaction fee for the services offered.

How to use a mobile wallet?

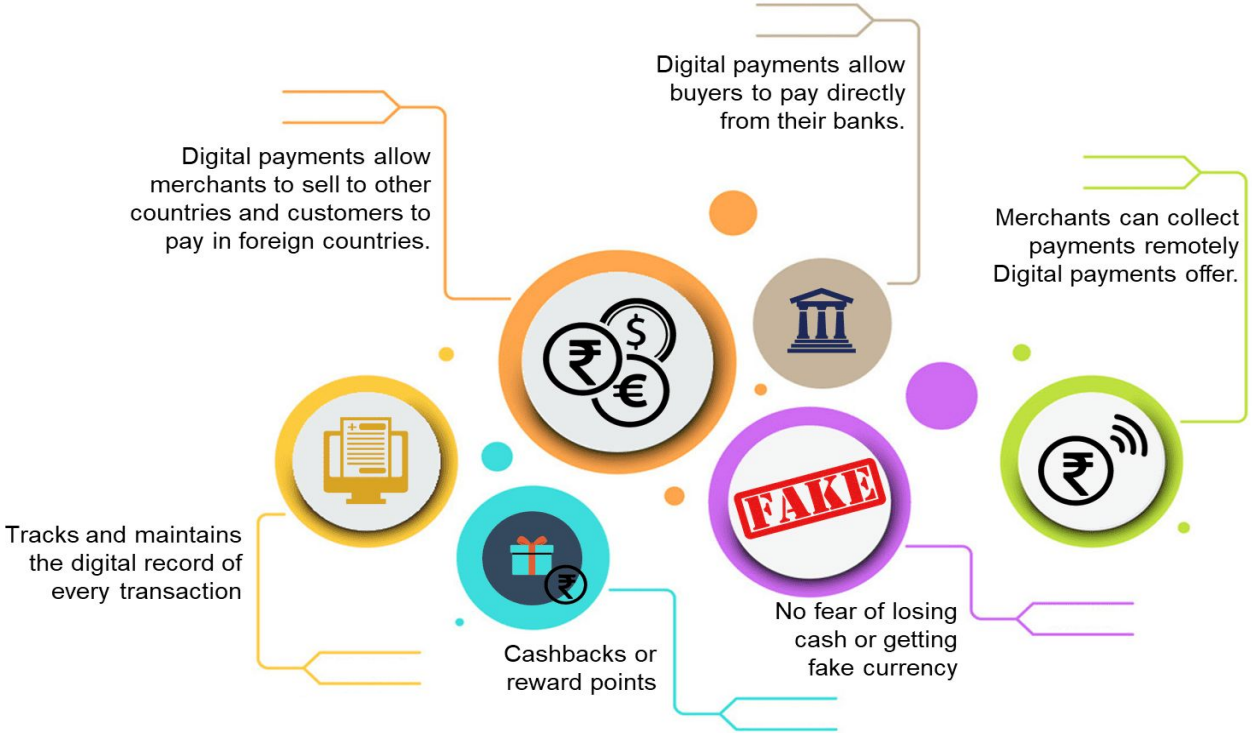
✔Download the app
✔Register for the service by following instructions and providing all details
✔Load money

Modes of Digital Payment

Internet Banking

✔It refers to the process of carrying out banking transactions online.
✔also referred to as e-banking or virtual banking.
✔These include services such as transferring funds, opening a new fixed or recurring deposit, closing an account, etc.
✔usually used to make online fund transfers via NEFT, RTGS or IMPS.
✔Banks offer customers all types of banking services through their website and a customer can log into his/her account by using a username and password.
✔No time restrictions for internet banking services and can be availed at any time and on all 365 days in a year.

Benefits of Digital Payment



Benefits of Digital Payment

One of the most significant advantages of digital payment is the **seamless experience they provide to customers**. Reduced dependency on cash, fast transfer speed, and the ease of transacting make online payments a preferred option. Besides these, digital payments offer following significant benefits:-

Cost savings through greater efficiency and speed.

Transparency and security by enhancing traceability and accountability, reducing corruption and theft as a result.

Benefits of Digital Payment

Financial inclusion by increasing access to a range of financial services, including savings accounts, credit and insurance products.

Women's economic participation by giving women more control over their financial lives and providing them greater economic opportunities.

Inclusive growth - digital payments help unlock economic opportunity for the financially excluded, and enable a more efficient flow of resources in the economy.

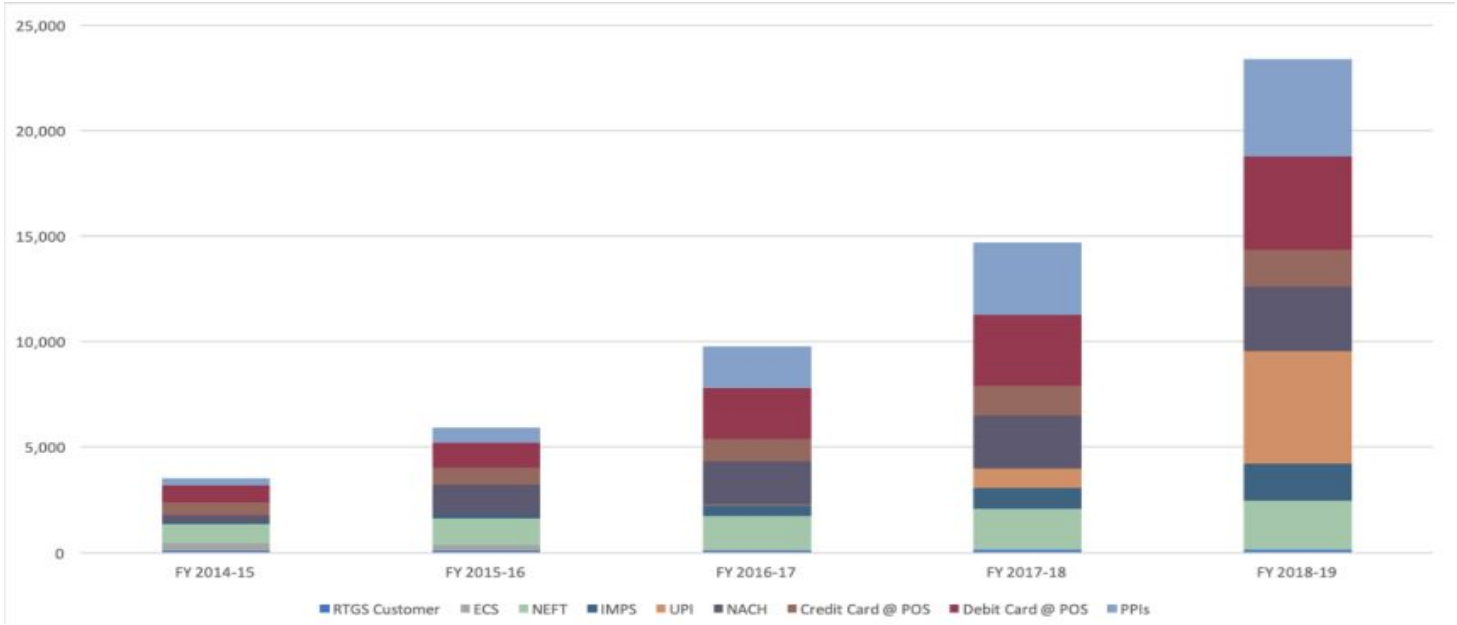
Challenges/Threats of Digital Payment

Inspite of so many advantages, consumers still don't use digital payments because of following reasons:-

- ✔Higher risk of identity theft – (Lack of Trust)
- ✔Security Concerns
- ✔Disputed Transactions
- ✔Increased Business Costs
- ✔Service Fees
- ✔Technical Problem
- ✔Remote Areas with no internet
- ✔Difficult for tech-unsavvy
- ✔Lack of awareness in rural areas
- ✔Pervasiveness
- ✔Habit
- ✔Friction
- ✔Need of using smartphone
- ✔Better data plans

Use of Digital Payment – Rising Trend

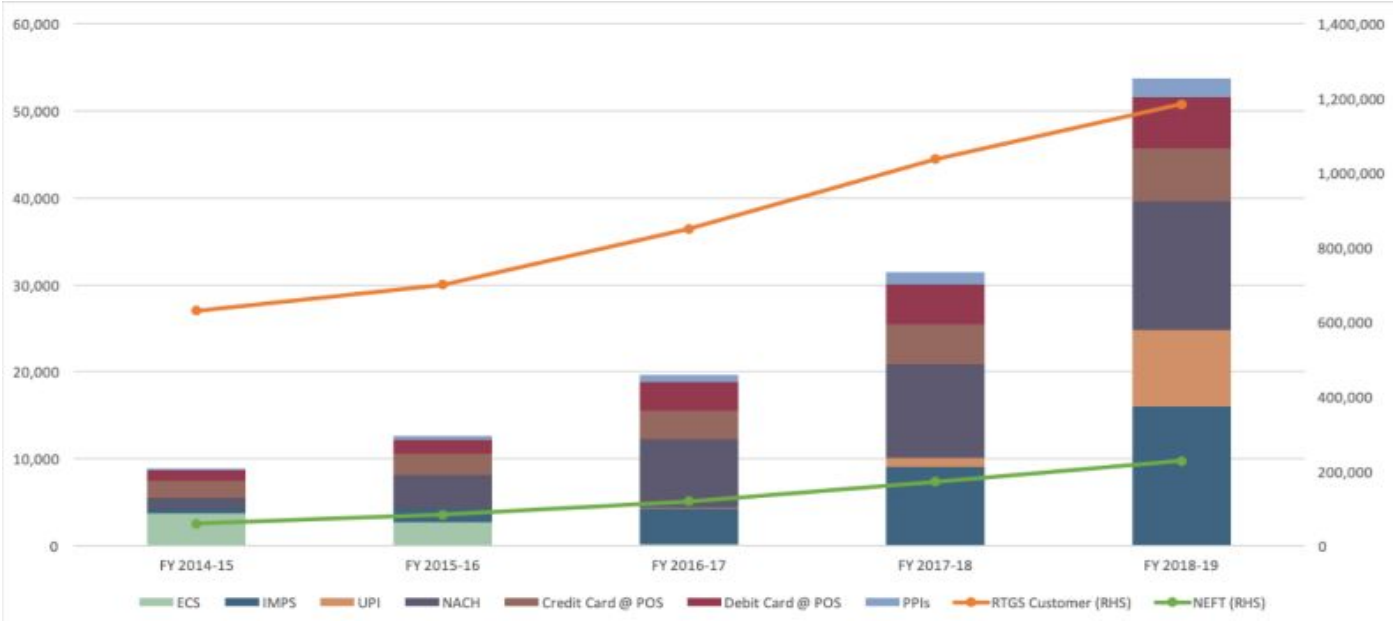
Based on the data from the RBI- Reserve Bank of India, we see the following growth in India



Digital payments by volume over last 5 years

Use of Digital Payment – Rising Trend

Based on the data from the RBI- Reserve Bank of India, we see the following growth in India



Digital payments by value over last 5 years

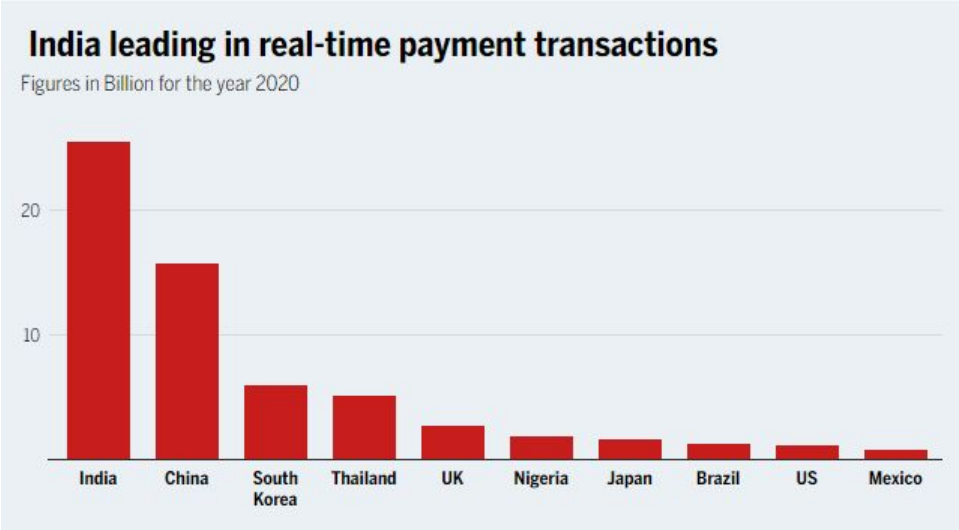
What has fuelled Digital Payment ?

Demonetization
High Smartphone Penetration
India's biometric identity card

Improved Digital Infrastructure
Low cost smartphone
Reduced ATMs

Cheap Internet Data
Digital literacy
More UPI apps

More and more people are adopting digital payment system that India has outpaced the world in digital payments.



Future of Digital Payment

It is estimated that India's digital payments industry will grow to more than 300% of its current size by 2025.

The figure outlines the five key areas expected to be among the trending themes within the overall payments space in India.

Introducing Digital (Virtual) Currency in India

1. Digital currency or rupee is an electronic form of money, that can be used in contactless transactions.
2. The digital rupee will be the digital version of physical cash issued by the RBI and will, therefore, be sovereign backed.

Similarity between Digital rupee, bitcoin, doge, Ethereum

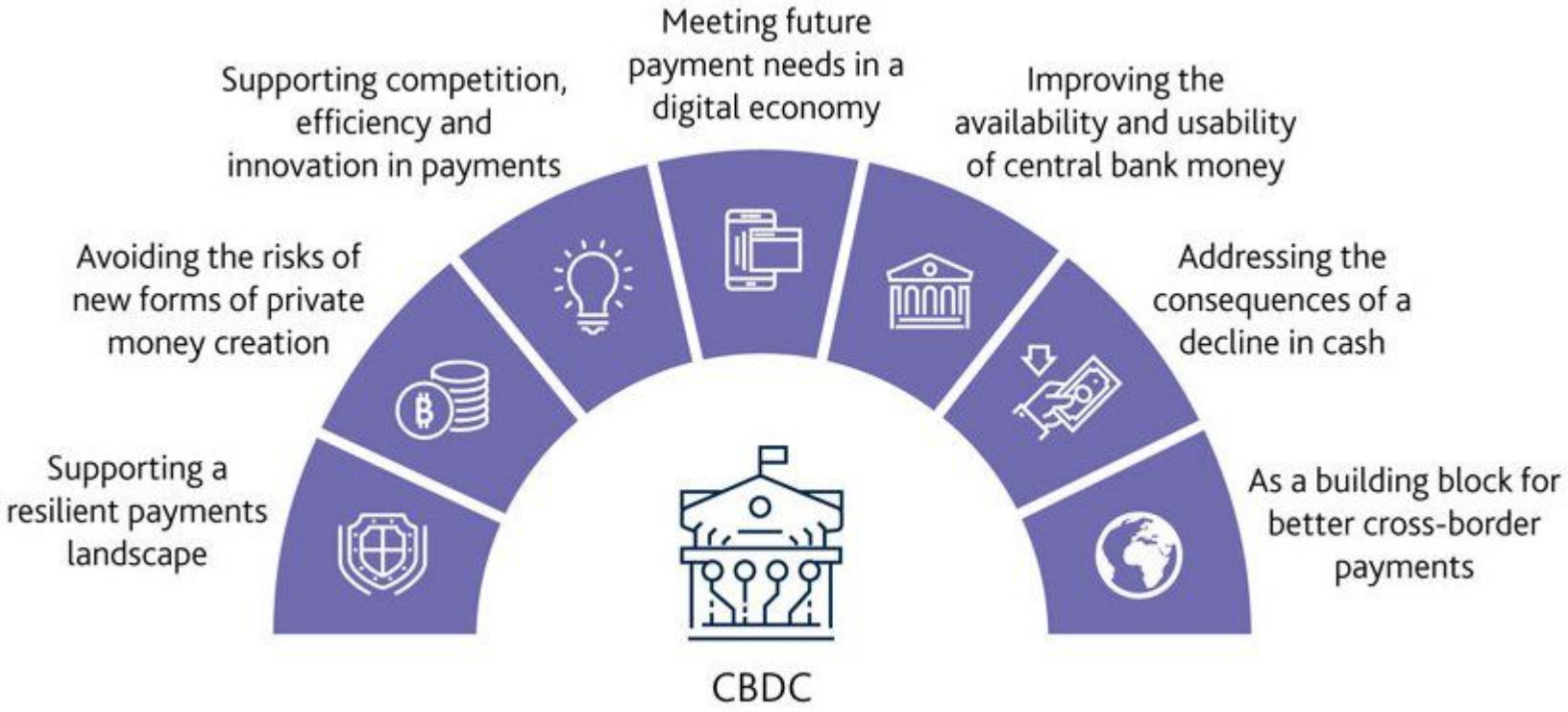
It is the same as bitcoin in terms of technology used that is Blockchain technology.

Difference between digital rupee and cryptocurrency

The Fundamental difference between the digital rupee and cryptocurrency will be that the digital rupee, being issued by RBI will most likely be Centralised.

“Introduction of a central bank digital currency will give a big boost to the digital economy. Digital currency will also lead to a more efficient and cheaper currency management system," ***Sitharaman had said in her Budget speech.***

Introducing Digital (Virtual) Currency in India



Impact of Digital Payment on India

Digital payment is one of the empowering system in India promoting digital India, which leads to transparency of cash in the country and directly control the black money in India by tax payment and transparent cash flow of every individual.

Digital payment helps India in every sector by providing security and safety in relation to cash and also by advancing the lifestyle by adoption of latest technologies for globalization and modernization of our country which leads to the development.

India government taking all the steps and polices as digital India, digitalization, demonetization, better infrastructure etc. leads to the development of India.

This step of the Indian government even attracted various investors in the country.

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- https://economictimes.indiatimes.com/here-are-the-advantages-of-cashless-payments-and-the-pitfalls-you-should-beware-of/tomorrowmakersshow/55956343.cms
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Thank you

ROLE OF ICT IN DEVELOPMENT OF SMART CITIES

Group 3

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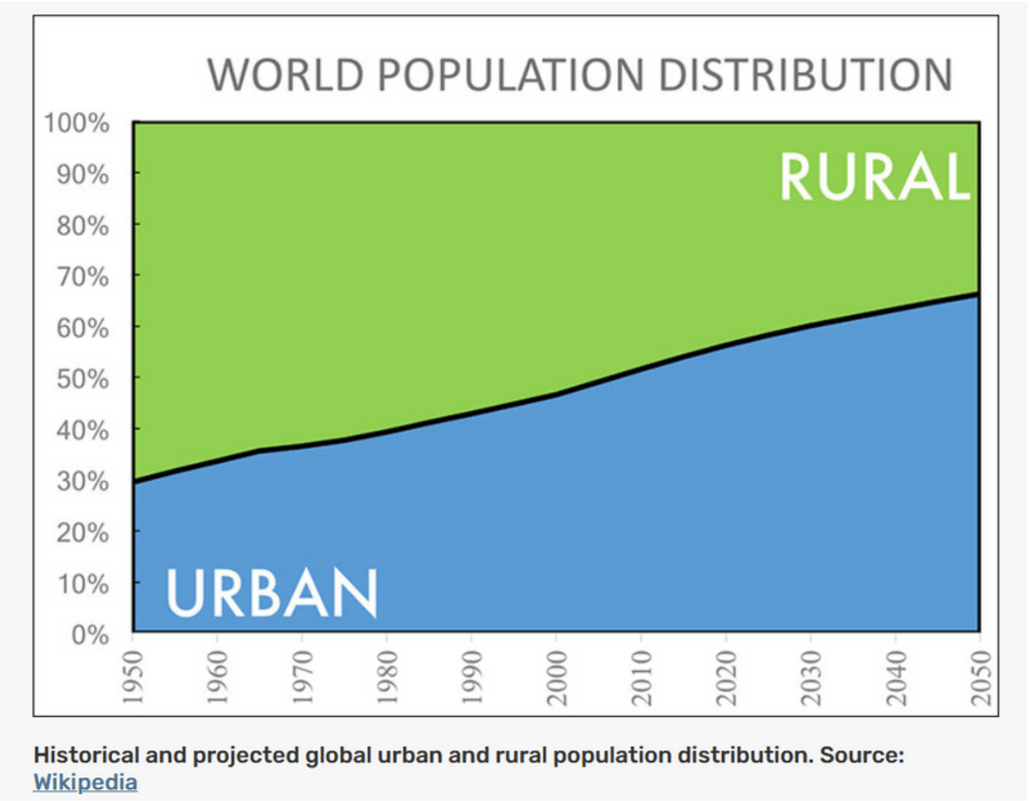
Outline

- Introduction
- About Smart city
- Objectives
- Economic and Social conditions
- Strengths
- Vulnerabilities
- External Oppurtunities
- Threats and Attacks
- Expected Results
- Methodologies to improvise Smart cities
- Fundamental Technologies
- Application of ICT in Smart cities
- Management of Smart cities using ICT
- Using ICT principles in building Smart cities
- Smart Cities Mission in India
- Achievements
- Impact of ICT on Smart cities
- Conclusion
- References

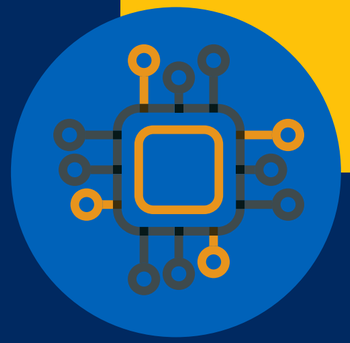
Introduction

“The world’s cities are relentlessly growing. It is predicted that by 2050, 64% of the developing world and 86% of the developed world will be urbanized”



Historical and projected global urban and rural population distribution. Source: Wikipedia

Smart City



- A smart city is an ultra-modern urban area that addresses the needs of businesses, institutions, and especially citizens.
- The main goal of a smart city is to optimize city functions and promote economic growth while also improving the quality of life for citizens by using smart technologies and data analysis.

ROLE OF ICT

ICT in the Smart City is used to enhance the quality, performance, and interactivity of urban services, reduce costs and resource consumption, and improve contact between citizens and city stakeholders.

Objectives

- Optimized management of energy resource
- Decentralized energy production
- Safety and Security
- Environment and Transportation
- Educational facilities
- Tourism

Project Context

Economic & Social Conditions

- Citizens or inhabitants of the city play a major role in developing smart cities through ICT.
- E-governance is the most fundamental component that has to be considered to make a city smart.
- It facilitates citizen involvement in governance using ICT.
- Links citizens, businesses, and government institutions in a seamless network of resources, capabilities, and information exchange.

Fig 2.

Fig 3.

- Smart cities need citizens to be continuously connected in order to share their knowledge and experience.
- Awareness and education are crucial to making citizens understand the role ICT plays.
- A country's adoption of a new technology eventually facilitates economic growth and improves the perceived standard of living.
- Developing the urban management to meet citizens' current needs and demands, and improve their quality of life through ICT-based Smart city services can be considered to be a successful implementation of the project.

Fig 4.

VS

STRENGTHS

VULNERABILITIES

Strengths

- High potential for job opportunities
- Creation of safer communities
- Improved urban transportation
- Optimization of time in hospital and public service lines
- Evolution towards the Internet of Things (IoT)
- Implementation of new business opportunities
- Creation of services that respond more effectively to the needs of citizens
- Improving the environment through various systems

Vulnerabilities

- Lack of investment
- High energy consumption
- Need of smart citizens
- Privacy issues
- Data security issues
- Prone to cyber-attack
- Interoperability of multiple technologies
- Larger technological gaps
- Considerable increase in electronic waste

EXTERNAL OPPORTUNITIES

Government:

- Smart buildings, smart grid
- Smart utilities such as CCTV,GPS tracking
- Incidence-response systems for reducing crime

Economy:

- Gives rise to more business opportunities and investment of innovative solutions.

Smart citizens:

- Higher awareness of technologies and power saving features.
- Increasing the quality of life through virtuous citizens.

contd..

IoT management:

- Promotes data availability and in sync with the various other components of a smart city.

Smart Mobility:

- Reduction in traffic jams.
- Reduction in environmental and noise pollution due to energy consumption.

Sensor networks and human sensors:

- Flood monitoring Disaster and incident management

Threats & Attacks

- Security and privacy breach
- Data and identity theft
- Man-in-the-middle
- Device hijacking
- Distributed Denial of Service (DDoS)
- Permanent Denial of Service (PDoS)

Expected Results

1

Transportation

Traffic flows will be monitored and optimized

2

Jobs

Advancement in technology plays key role in increasing job opportunities

3

Energy

Integration of renewable energy & rise of intelligent systems increases efficiency

Expected Results

4

Citizens

Spread of smart technology transforms society

5

Services and Security

Safer society established with increase of fully automated services

6

Eco Friendly

Increased use of Renewable sources of energy minimizes pollution

Methodologies to improvise smart cities

1

Broadband infrastructure

Increase of wireless network reduces the need for physical components

2

E-services

Contact-less delivery
Avail services from any part of the world with ease

3

Open government data

Free usage of information
Can be reused and re-distributed

4

E-governance

Quick efficient and transparent process, provides at-most accuracy

5

Sustainable Infrastructure

Increases resource efficiency in all possible domains

contd..

Fundamental Technologies

Ubiquitous computing

This technology includes heterogeneous devices that communicate directly through heterogeneous networks.

Big-Data

This helps to improve the living standards for all entities of a smart city.

Networking

This technology allows multiple devices to connected.
Modern networks (Wireless networks) can be used in smart buildings, smart water networks, Intelligent transportation etc..

contd..

Cloud Computing

Cloud computing technologies enables easy network access to data resources shared.

Cyber Security Architecture

Privacy of government and citizens is a major challenge in smart cities. These also include sensitive issues like people’s safety.

Combines real-time data from connected assets, objects, and machines to improve decision making

HOW IS ICT APPLIED IN SMART CITIES?

Citizens will be able to engage and interact with smart city ecosystems through mobile devices and connected vehicles and buildings

By pairing devices with data and the infrastructure of the city, it is possible to cut costs, improve sustainability and streamline factors

How are Smart Cities Managed?

Absolute Scalability, Modularity, and Compatibility

Citizen Relationship Management

High Data Security

Automated Information and Working Systems

Public-Private Sector Integration

Building a smart city using ICT principles

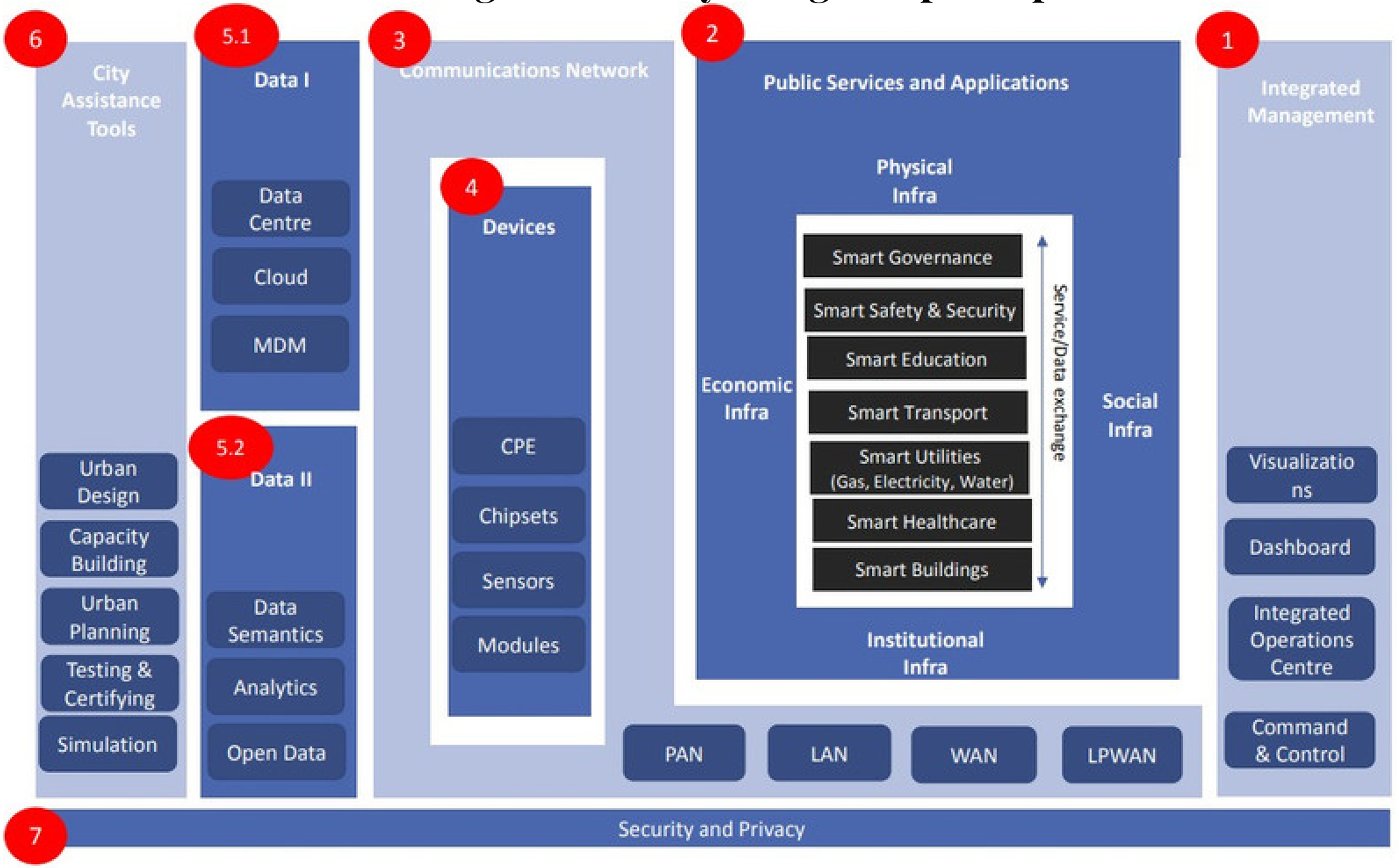


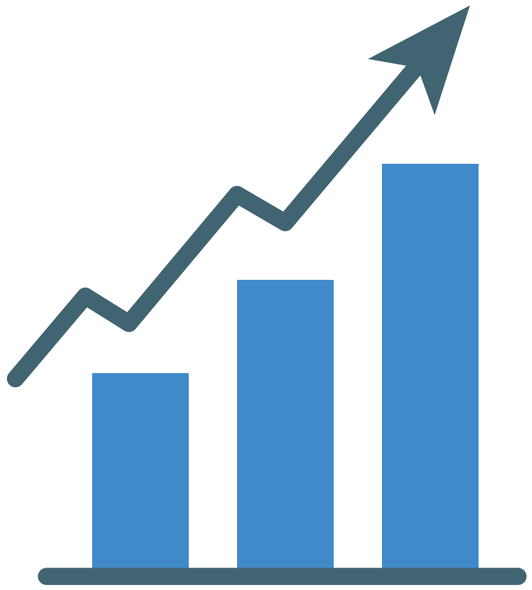
Fig 5.

Smart Cities Mission in India

The 100 Smart Cities Mission in India was launched by Prime Minister Narendra Modi on June 25, 2015.
The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with state governments - expected to complete between 2019 and 2023.

Fig 6.

SOME ACHIEVEMENTS...



1. Tirupati is nurturing local arts and crafts through digital training. It has created a digital platform which allows artists to share designs with crafts persons.

2. Surat is also providing amenities such as better roads, footpaths, utility crossings, median parking, hawking zones, art galleries, children’s play areas under the Mission and increasing its green cover along a canal.

contd..

3. Thiruvananthapuram has set up three smart anganwadis, with renovated buildings, upgraded activity areas, and CCTV surveillance.

4. The Tumakuru police have developed a mobile app called Lockdown House Monitoring to improve security in the city, which citizens can download and seek police help.

Impact of ICT on Smart Cities

- Aims to enhance citizen’s quality of life.
- Ensure public safety, healthcare and education.
- Promote an economic growth by generating employment
- Prepare preventive and counter measures for quick incidence response.
- Utilize clean energy to fill today’s needs without harming the future.

Conclusion

- The advantages of a ICT in developing smart cities boost quality of citizen's life while also providing the government with more resources to further develop the city.

- Advantages of a smart city outweigh the disadvantages.

- Overall, smart cities are the way to go because of their complexity, which allows them to meet a wide range of qualitative aspects in a modern civilization.

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Fig 7.

FASTag on highways

GROUP 4

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Content

Introduction

- Since traffic on highways is increasing day by day, there is a need to maintain highways and create new highways which lead to economic and social development of a nation.

- For that purpose, government charges tax on vehicles on highways generally known as toll tax.

- There are some ways to collect these taxes like:
  - Using toll booth to manually charge every vehicle passing through a booth
  - Using FASTag to automatically deduct toll tax money from vehicle owner’s bank account.

Indian Highways

Indian Highways

- Highways: a main road, especially one connecting major towns or cities.
- Indian Highways are owned by the Ministry of Road Transport and Highways, Indian Government.
- India has 151,019 km (93,839 mi) of National Highways as of March 2021.
- National Highways constituted 2.91% of India's total road network, but carried about 40% of road traffic.
- Longest National Highway in India is NH-44 (Srinagar to Kanyakumari) at 3,508 km (2,180 mi).
- Shortest National Highway in India is NH-966B which covers a distance of 8 kilometres (5.0 miles) between Kundannoor and Willingdon Island in Kochi.

Source: National highways of India - Wikipedia

Importance

- Important for transportation of goods across the lengths and breadths of India.
- Provides conveyance to the people, goods, raw materials, etc., to reach different parts of the country.
- Only source of communication in hilly regions.
- Improves connectivity to village areas leading good medical facilities.
- Generates more employment opportunities.
- Improves the land value.
- Helps in agricultural, dairy, tourism, fisheries development.
- They play important role in defence activities.
- They become the symbol of country's progress and development.

Source:
Highway Engineering - Definition, Importance, Characteristics & Classification of Highways (brandedcivil.com)

Contribution of Highways in development

- The pulsating economy of a country depends on the roads that serve as its arteries.
- By linking producers to markets, workers to jobs, students to school, and the sick to hospitals, roads are vital to any development agenda.
- Highways helps in increasing the social development of a country by connecting people of different cultures.
- Roads have a positive effect on economic growth and societal development.
- Construction of roads support commerce and communication between people and countries
- Increases living standards and economic activity and it has been a driver for peace and prosperity.

Source: https://blogs.worldbank.org

Toll Collection

- Toll is the Amount that vehicle have to pay while crossing the interstate highways, bridges or tunnels.

- Toll Plaza
  - Manually operated
  - Car will stop at Each Booth
  - Operator will collect Cash & provide receipt
  - Gate open, either mechanically or electrically

- After Paying the toll tax, in case of two way ticket, receipt needs to preserve to show at further toll booth.

Toll Collection

- Amount of toll is calculated based on
  - Length of toll Road (Usually 60km)
  - Infrastructure type (bridge, tunnel, bypass)
  - Type of vehicle
- Let's Say we're Going from Delhi to Lucknow

Toll location	One way	Return	Monthly
Yamuna Expy **Start:** Jewar **End:** Hazipur Khera	₹415.00 ₹830.00	₹665.00	₹13,695.00
Taj Express Hwy **Exit:** Inner Ring Rd, ADA, Raipur	₹35.00 ₹70.00	₹52.50	₹1,155.00
Agra Lucknow Expy **Start:** Agra **End:** Lucknow	₹600.00 ₹1,200.00	₹940.00	₹19,800.00

Source: https://tollguru.com/toll-calculator-india

Toll Collection

- Let us consider a very efficient Toll Collection System is very efficient i.e time taken for overall collection of toll for every vehicle is only 50s, then total time taken in a month is 50s x 30 = 1500s. Hence for 1 year time becomes 18000s i.e. 5 hours.
- If Each day 200 cars passes then yearly 72000 cars have to wait 5 hours at toll plaza on an average.
- There are 566 toll plazas as per NHAI.
- That much time corresponding to wastage of fuel, time and money. Also, Pollution problem will also arise.

Source : https://www.researchgate.net/publication/325712923_A_Comparative_Study_of_Toll_Collection_Systems_in_India

Problems

- As mentioned above vehicle may have to wait in queue for sometime
  - Due to absurd amount of toll i.e 54 or 83 Rs
  - Absence of the Staff
  - Malfunctioning of the System
- Wrong Lane Driving
  - Lack of Sense of Driving
  - Missing Exit Signs
- Bad Conditions of Roads in Highways.
  - Potholes
  - Heavy Overloaded Trucks
- Overspeeding
  - accidents

Source:
https://www.moneylife.in/article/six-problems-with-indian-highways-and-11-ways-to-improve-them/37976.html

Solutions

- There must be speed-capture cameras installed in highways to control the problem of overspeeding.
- Compulsory surveillance of road condition after every certain period of time.
- Enforcement of laws against the overloading of Trucks etc.
- For solving the queuing problem at toll plaza, online toll transaction system should be implemented i.e. FASTag

FASTag

History of Electronic Toll Collection

- **1959**: William Vickrey proposed a system of electronic tolling in which each vehicle was equipped with a transponder
- **1970**: free flow tolling was successfully tested with vehicles equipped with transponders at undersides and readers located under the surface of the highways
- **1986**: Electronic toll collection technology was first introduced in Bergen, Norway, operating together with traditional booths.
- **1991**: World's 1st completely unaided full-speed electronic tolling system was introduced in Trondheim.
- **1995**: Portugal became the first country to apply a single, universal system to all tolls in the country.
- **2005**: Santiago, Chile became the world’s first city with 100% full-speed electronic trolling with transponders in a system of severn urban freeways.
- **2007**: United Arab Emirates (UAE) implemented a similar road toll collection in Dubai.

History Of FASTag In India

- **2014:** The system was initially setup as a pilot project in 2014 on the stretch of the Golden Quadrilateral between Ahmedabad and Mumbai.
- **4th Nov 2014:** The system was implemented on the Delhi-Mumbai arm of the Quadrilateral.
- **July 2015:** toll plazas on the Chennai-Banglore stretch of the Golden Quadrilateral started accepting FASTag payments
- **April 2016:** FASTag was rolled out to 247 toll plazas on national highways across India, representing 70% of all toll plazas in the country at the time.
- **23rd Nov 2016:** 347 free plazas out of 366 on national highways across the country accepted FASTag payments.
- **1st Oct 2017:** the NHAI launched FASTag lane in 370 toll plazas under its ambit.
- **8th Nov 2017:** NHAI made FASTag mandatory on all new vehicles sold in India after December 2017.
- **19th Oct 2019:** It was announced that FASTag will be mandatory on all National Highways from 1st December 2019 and non-FASTag users will be charged double the toll.
- **Nov 2019:** Hyderabad airport launched FASTag Car Parking facility.
- **1st Jan 2021:** FASTag was made mandatory at every toll plaza in the country. (later date was postponed to 15th Feb 2021)

FASTag

- FASTag is an electronic toll collection system in India, operated by the National Highway Authority of India (NHAI)
- It is affixed on the windscreen of the vehicle and enables to drive through toll plazas without stopping for transactions.

TAG Class	Vehicle Description
4	Car / Jeep / Van/ Tata Ace and similar mini light commercial vehicle
5	Light Commercial Vehicle
6	Three Axle Commercial Vehicles
7	Bus/Truck
12	4 to 6 axle
15	7 or More Axle
16	Heavy Construction Machinery (HCM)/Earth Moving Equipment (EME)

Technologies Used in FASTag

- Automated Vehicle Identification (AVI) is the method for determining the identity of a vehicle when it is in the toll gate area.
- Earlier, bar codes were used.
- Current AVI systems mostly rely on Radio Frequency Identification (RFID).
- A FASTag has what is called a passive RFID chip.

Technologies Used in FASTag

- The RFID technology uses an Electronic Produce Code (EPC) through which every vehicle can be uniquely identified.
- Each EPC code, which is a 13-digit number, in the RFID-FASTag is issued by GS1 India.
- At a toll plaza, when a vehicle comes within a certain radius, the scanner is able to send out the signals and read the tag.
- Since a FASTag is pre-charged with money, it hits the payment that is inside the tag and deducts the toll amount
- National Payment Corporation of India (NPCI) ensures the data security in the case of RFID-FASTag
- Proper IT infrastructure with backend servers in a place where all the data is captured.

Working Of FASTag

- Whenever a vehicle will pass through the Electronic Toll Collection (ETC) lane of the Toll Plaza, the system will capture the FASTag details like (Tag ID , vehicle class , TID , etc.) and send it for processing to the acquiring bank.

- The acquiring bank will send a request to the National Electronic Toll Collection(NETC) Mapper to validate the tag details.

Working Of FASTag

- Once the TAG ID will get validated, NETC Mapper will respond with details like Tag Status, Vehicle class , VRN, etc. If the TAG ID is not present in NETC Mapper, it will respond as the Tag ID is not registered.

- The acquirer host will calculate the appropriate toll fare and initiate a debt request to NETC system after successful validation of Tag ID from NETC Mapper.

- NETC System will switch the debit request to the respective issuer bank for debiting the account of the customer.

Working Of FASTag

- Issuer host will debit the linked tag holder account and send an SMS alert to the tag holder. The issuer host will also send the response message to the NETC system. If the response is sent within the defined TAT, the transaction will be considered as Deemed Accepted.

- NETC system will notify the response to the acquirer host.

- Lastly, acquirer host will notify to respective toll plaza system.

NETC System


1
8
2
3
4
7
NETC
NATIONAL ELECTRONIC TOLL COLLECTION
ONLINE SWITCH
& MAPPER
5
6
Toll Plaza System
Acquirer
Issuer

Structure Of NETC

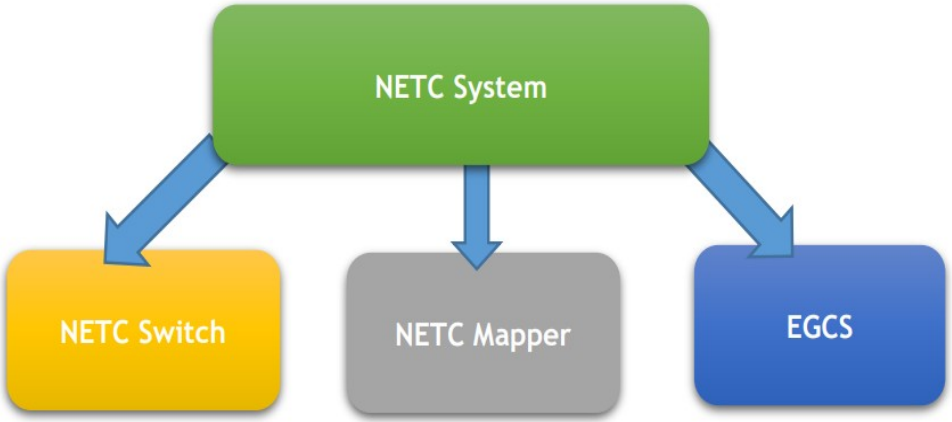
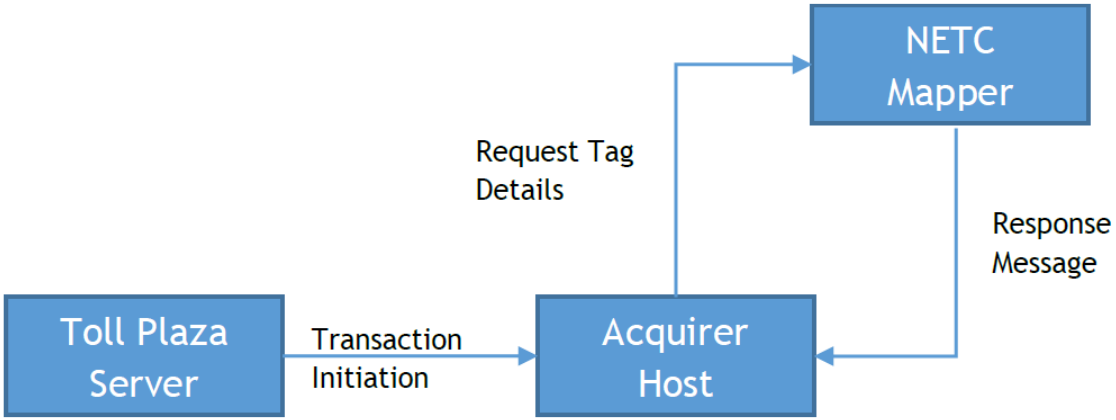


Figure 2 - NETC System

How does Acquirer obtain the tag information?

6.1 Request NETC Tag Details



How Is Toll Fare Calculated?

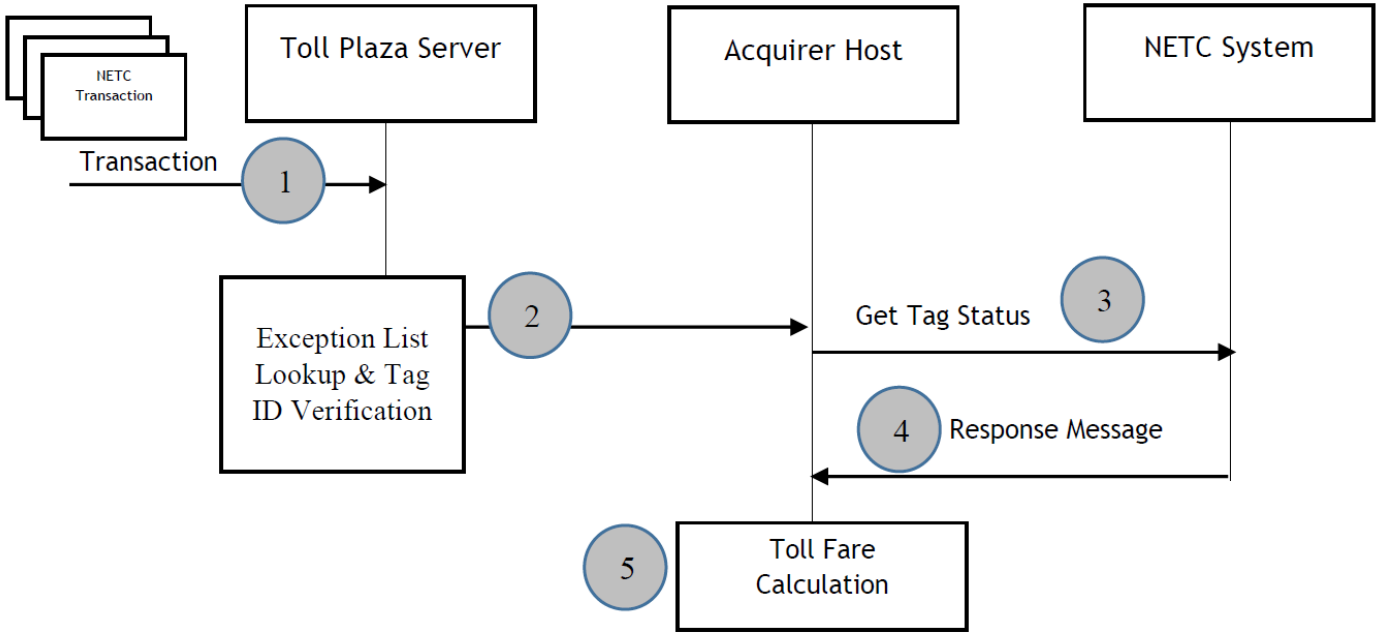
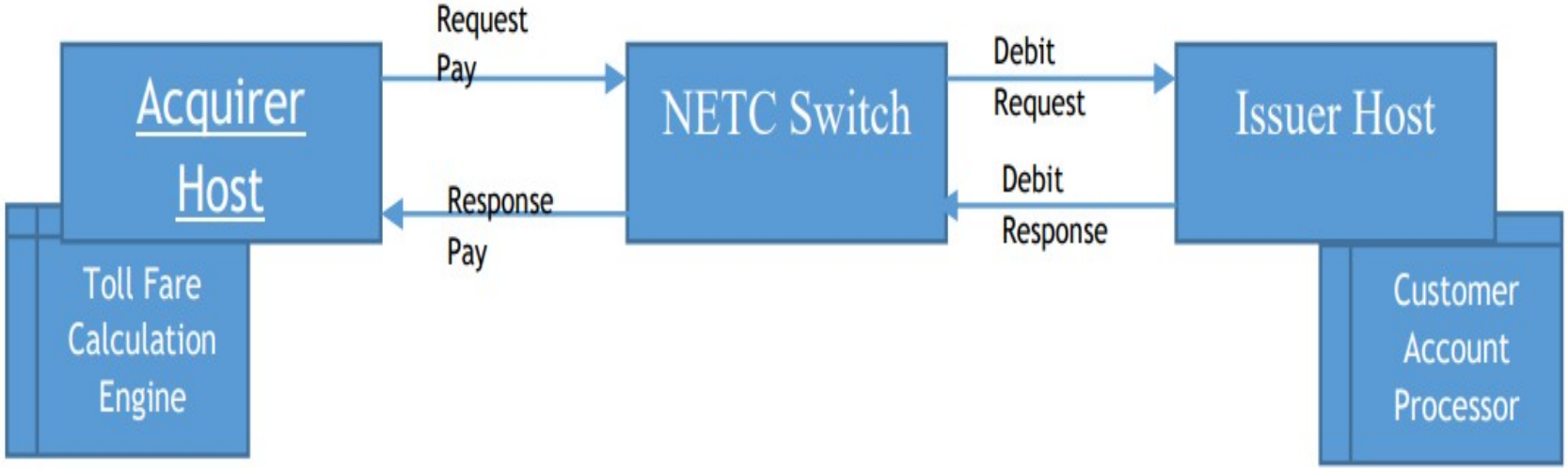
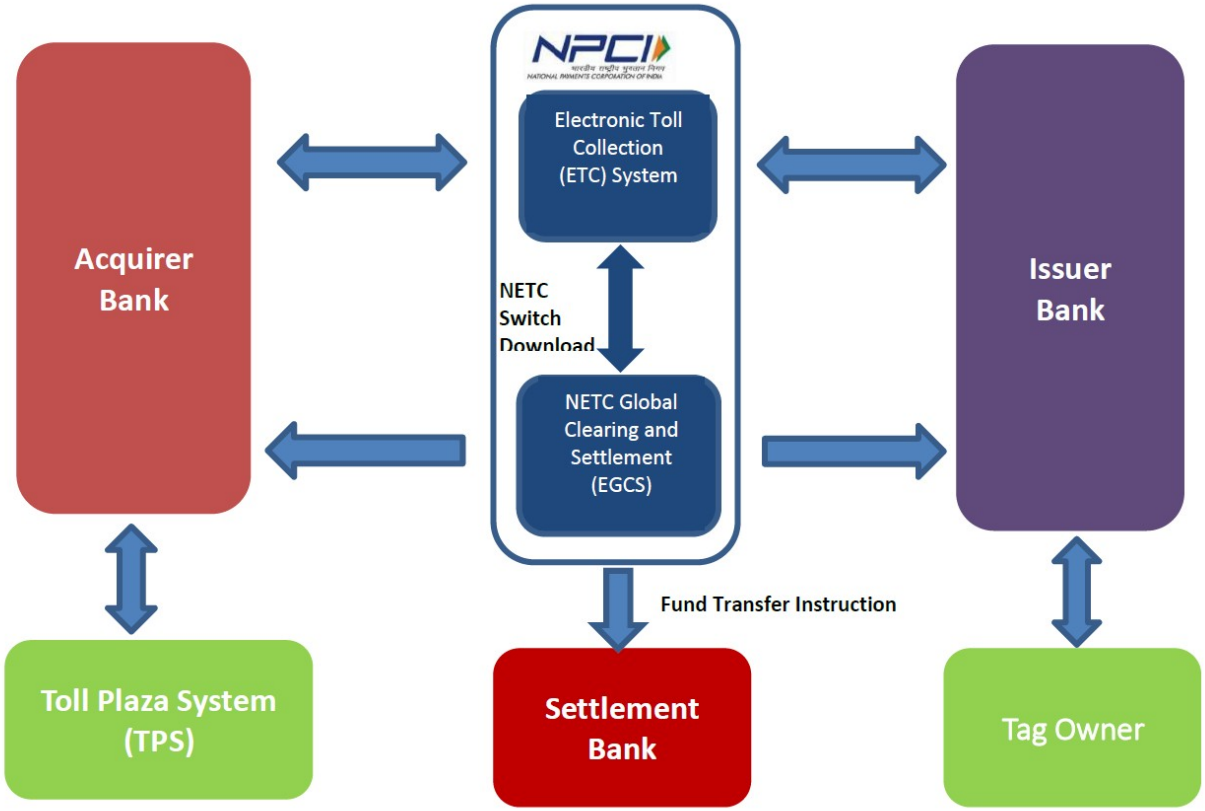


Figure 3 - Toll Fare Calculation

How is the Request Forwarded to the Issuer?



How is the exchange between



Need Of FASTag

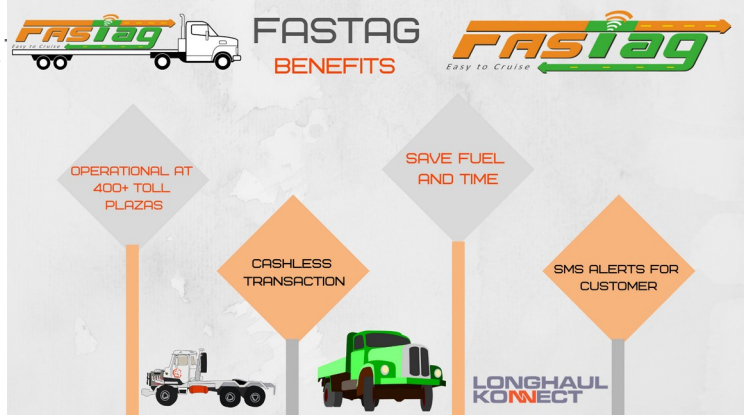
- Why is there a need of FASTag????

- A joint study in 2014-15 by the Transport Corporation of India and the IIM-Calcutta, estimated the cost of delay on Indian roads at $6.6 billion per year. The cost of additional fuel consumption due to delays was also put at $14.7 billion per year.
- If mileage can be improved by increasing fuel efficiency, improving road conditions and reducing stoppage delays, the impact on the economy could be huge.
- Also India's toll taxes are hotbeds for corruption. Transparency in the transition and cash flow can help overcome this problem.
- That's where fastag can really help a lot.

Ref: The Hindu

Benefits Of FASTag

- Ease of payment.
- Near non-stop movement of vehicles leading to lower fuel cost.
- Online Recharge FASTag can be recharged online through Credit Card / Debit Card / NEFT/ RTGS or Net banking.
- SMS alerts are sent to the FASTag holder for toll transactions, low balance, etc.
- Environmental benefit like reduced air pollution and less use of paper.
- Social benefit like less time taking toll payment is hassle-free and analytics for better highway management.
- Economic benefit like the reduced effort in management at the toll plaza and the reduced effort in monitoring centrally is also beneficial.



FASTag & Development

- Fastag has helped in easing the lives of consumers/users. It has helped in removing problems like traffic congestion, easy traffic management, saving fuel and many more.
- It has played a crucial role in growth of overall development. It has helped in giving a boost to the Cashless India policy by allowing the payment of toll tax online. Acc. to a report, the electronic toll collection is set to boost royalty by 10,000 crore per annum.
- It has also helped in saving a lot resources of the government. A lot of money used to go in the infrastructure and toll management. Also digitization of the process has made the analytics and other process easy.
- Also the government has big plans to take fastag a step forward. By 2022, they want to make each and every toll plaza digitised and equipped with FASTAG.

Ref: Economic Times

FASTag & Development

- The government took a leap in logistics by introducing e-way bills to check tax evasion by tracking the movement of goods and establishing direct linkage between what is declared and what is actually moved. Now it is trying to make the e-way bill system even stricter. It has found an innovative way to check evasion of the Goods and Services Tax (GST). It is planning to link the GST Network with FASTag mechanism of the National Highways Authority of India (NHAI) and Logistics Data Bank (LDB) services of the Delhi-Mumbai Industrial Corridor Development Corporation.

- The Central government also plans to enable the use of FASTag for a range of other facilities such as fuel payments and parking charges. Several States have already signed memoranda of understanding to join the system.

Ref: The Hindu,The Economic Times

Challenges With FASTag

- Stolen, Lost, or Damaged Tags. Since the card is affixed to your windscreen, it can be easily misplaced, damaged or stolen.
- Double-Deduction. It's possible for the toll fee to be deducted twice from your account.
- Possible Technical Glitches.
- Blacklisted FASTag
- Unauthorized Deductions Through FASTag
- Blacklisted FASTag

Other Alternatives

- Payment can be facilitated through mobile wallets, credit cards, or net banking before reaching the toll plaza through an Android application. By using image processing, we wouldn’t require any smart device to be installed at the toll plaza as the processing can be directly done from the video feed received through CCTV installed at the toll plaza.

- Or We may map the starting and finishing locations of the highway using a geographic information system and a GPS on the car that is always connected to servers, and if that car passes any reference or marked point, payment will be made automatically if that toll has not been paid for yet.

Ref: A Comparative Study of Toll Collection Systems in India

Conclusion

- In this Presentation we've seen the overview of highways in India, its importance and problems related to it, then we looked some of the solutions that can be implemented to fix those problems especially FASTag.

- We learned about the History regarding FASTag, Also we dived deep into the workings of FASTag and various technologies related to it and their working. Then we explored the need and relationship of development with FASTag and lastly in the end we talked about challenges and alternatives of FASTag

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Thank You

ICT for Disaster Management

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INTRODUCTION

- Disaster - Impact of Natural or man-made hazards that causes human suffering.
- Disaster management is an essential component of development framework that is often treated in whole, rather than as a considering multiple different issues.
- Proper disaster management - Key requirement towards achieving the Millennium Development Goals.
- There are different phases involved in Disaster Management in which every phase involves usage if ICT .

Disaster management cycle

- Mitigation
- Risk Reduction
- Prevention
- Preparedness
- Response
- Recovery

ICT FOR DISASTER RISK REDUCTION

- Information and Communication Technology (ICT) systems play a crucial role
- Online Inventory of Emergency Resources
- The IDRN (India Disaster Resource Network – www.idrn.gov.in)
- ICTs have been used to deliver DRM training and education online.
- Youth In Action - Play the Stop Disasters! Game

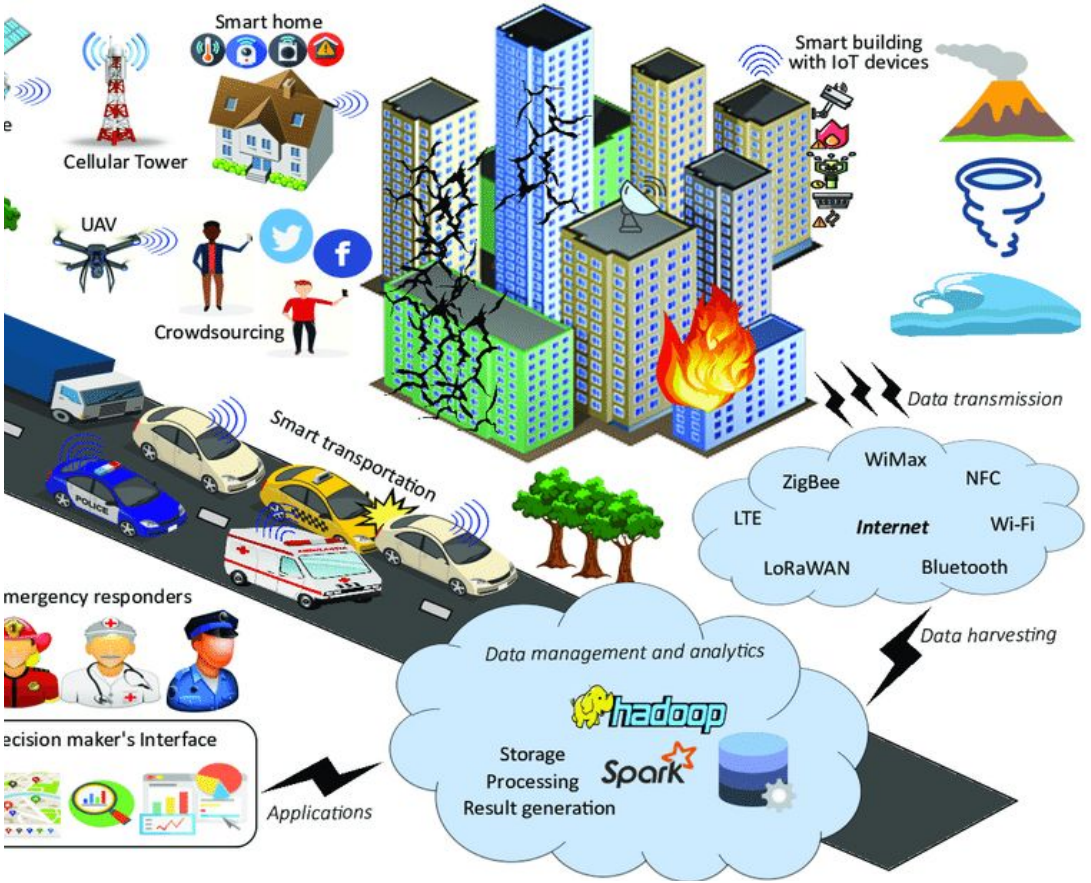
Channels Used for Disaster Warning

- Radio and Television
  - Spreads a warning quickly to a broad population

- Telephone (Fixed and Mobile)
  - Telephone trees

- Short Message Service
  - SMS works on a different band and can be sent or received even when phone lines are congested.

- Cell Broadcasting
  - Public delivery
  - Disaster management
- Satellite Radio
  - IRS Series
  - Disaster Management Support
- Internet(IoT)
  - Monitoring Activity
  - Planning for the Future



❖ Amateur Radio

➢ Amateur Radio is a scientific activity popularly known as “Ham Radio”.

➢ Amateur radio operators use two way radio stations and communicate with others similarly authorized using various modes of communication like voice, Morse code, computers, internet etc.

➢ The things that amateur radio operators do with their radios are as diverse as the people themselves. The advanced amateur radio communication techniques include Automatic Position Reporting Systems using GPS information, Internet linking of Repeater stations, Interface with internet for exchange of emails, images etc as well as visual communication modes.

❖ Community Radio

- A community radio station is one that is operated in the community, for the community, about the community and by the community. The community can be territorial or geographical - a township, village, district or island. It can also be a group of people with common interests, who are not necessarily living in one defined territory.

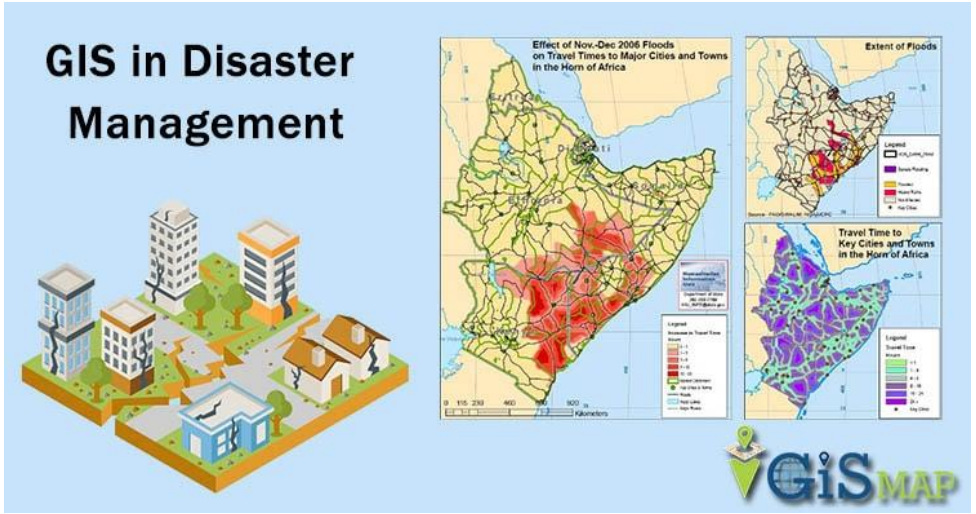
- community radio can be managed or controlled by one group, by combined groups, or of people such as women, children, farmers, fisher folk, ethnic groups, or senior citizens.

- What distinguishes community radio from other media is the high level of people's participation, both in management and program production aspects.

Geographical Information System (GIS)

- A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface.

- By relating seemingly unrelated data, GIS can help individuals and organizations better understand spatial patterns and relationships.



GIS and Disaster Management Cycle

Planning

- GIS is useful in helping with forward planning. It provides the framework for planners and disaster managers to view spatial data by way of Computer based maps.

Mitigation

- The Use of GIS in disaster management can help with structural and non-structural mitigation

- GIS Allows you to spatially represent areas at risk and the level of risk associated with a particular hazard, which can be a guide in decision making,

- It will facilitate the implementation of necessary mechanisms to lessen the impact of a potential emergency.

- With Gis, disaster managers are in a better position to determine level of mitigative structures that should be in place given the vulnerability of an area or population.

Preparedness

- GIS can help with the identification and location of resources and “ at risk” areas.
- It establishes a link between partners and critical agencies, which allow disaster managers to know where relevant partner agencies are stationed
- GIS maps can provide information on the human resources present in an Emergency Operation Center as well as on the ground personnel such as security, health providers and other key responders.
- This is particularly useful since the technology can help with strategic placement of emergency personnel where it matters most.
- GIS helps to answer the Question of who is to be based where and at what phase during emergency
- It can help to determine whether or not reload infrastructure and communications networks are capable of handling the effects of disaster and, if necessary, guide in the placement of resources.

ICT FOR DISASTER RESPONSE

The Indian Ocean Tsunami (2004) - Sahana Disaster Management System

Primary responses post a disaster:

- Tracing *missing people*
  - *Missing Person Registry* : An e-Bulletin board of the missing/found.
- Coordinating *Donor Groups*
  - *e-Organization Registry* : effectively track who is doing what, where, when.
  - Gauge whether there are areas in which services are not adequate.
- Recording Locations of *temporary shelters/camps*
  - An application to keep track of location of affected areas and camps.

Donor Groups: NGOs, Community Groups or any other which is reaching out to provide assistance. Could be in terms of food/items of need during time of disaster.

ICT FOR DISASTER RESPONSE (contd.)

Turkey Earthquake (1999) - Internet to the Rescue

Problems & Solutions:

- Telecommunications infrastructure was extensively damaged.
- Mobile phone networks operating with reduced bandwidth.
- Internet was the only possible medium that could connect the affected areas to the outside world.
- Internet was also used to provide information regarding the whereabouts of missing family members. For example, many organizations formed ‘message lines’, which acted as a database of people found, their condition or the degree of damage to the region in which relatives lived.

ICT FOR DISASTER RECOVERY

- Recovery refers to “**decisions and actions** taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk”.
- The principle of **'Build Back Better'** ,one of the pillars of Sendai framework is generally followed to use the disaster as a trigger to create more resilient nations and societies than before.

  *“**Every** **US$1 invested in making** **infrastructure disaster-resilient saves** **US$4 in reconstruction”*** : UNDRR

- ICTs can improve both the speed and quality of agency interventions, including post-disaster assessments, recovery planning and monitoring, and project/programme design and implementation

- ICT tools are then required to rapidly and systematically assess the significance of damages and losses, help define reconstruction strategies, set up a basis on geographical terms and sectors and help define priorities.

- Maps produced using GIS can visualize patterns, trends and correlations with other features. Also, information from various sources can be superimposed using GIS to identify risks and investment priorities, and to establish baselines for reconstruction.

- The **DesInventar** system can also be used to simulate disasters and study their impact. For example, it is possible to trigger an earthquake in the virtual environment and analyse its impact on a geographical area ranging from a municipality to a group of countries. The system forecasts information on the possible loss of human lives, impact on the economy and damage to infrastructure.

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Thank You!

Use cases of ‘Internet of Things’ that facilitate sustainable development goals

A case study by Group 7

The team

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IoT

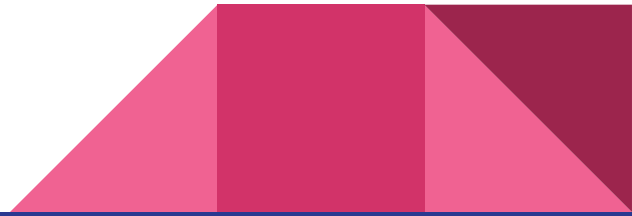
Internet of Things

- What is IoT?
- Why IoT?
- IoT in sustainable development

What is IoT?

- IoT is a system of devices connected to Internet with the ability to connect and exchange data from users and environment.

- The device or the thing in the could be any device embedded with electronic, software and sensor like a smart refrigerator, a smart AC, smart TV, smart watch, lights in house hold, connected security systems or even a person with heart monitor or an automobile



Why IoT?

- We want to **automate** everything
- We want to **control** everything remotely
- We want the data to be updated in **real time.**
- Why is the impact of IoT so large? At its core, IoT is about measuring and remotely controlling previously unconnected “things”. It reaches people and objects that older technology could not.

What are SDG's?

- First of all, what's sustainable? The ability to uphold something, in this scenario we are talking about development.
- Sustainable development goals can be termed as a blueprint to achieve a better and more sustainable future for all.
- Huge orgs like the UN adopted this in 2015.
- The UN adopted sdgs, their main intention is to end poverty, protect the planet and ensure that each and every person on this planet in 2030 has peace and prosperity.
- There are 17 sdgs.These are connected with each other.


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

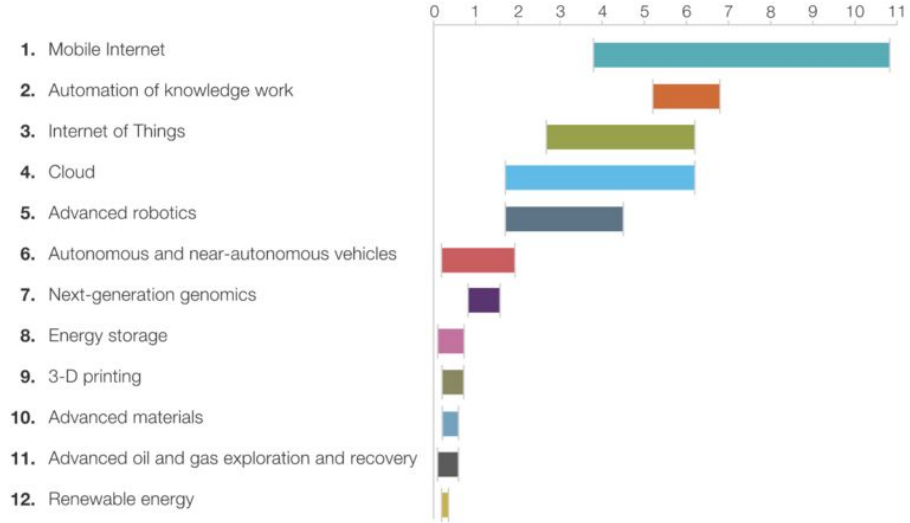
17 SDGs

Effect Of IoT on Sustainability

- Technology has driven global prosperity for centuries. Unfortunately, it has brought severe side effects
  Eg: CO_2 emissions, Water Pollution, Poor Mental Health.
- We have to use clean energy like (sun, wind).
- Many org like tesla are standing with development with sustainable energy, elon musk says CO_2 reduction is a key goal.
- The **Internet of Things** (IoT) is a **key** focus.

A gallery of **disruptive technologies**

Estimated potential economic impact of technologies across sized applications in 2025, $ trillion, annual



SOURCE: McKinsey Global Institute

Notes on sizing: These economic impact estimates are not comprehensive and include potential direct impact of sized applications only. They do not represent GDP or market size (revenue), but rather economic potential, including consumer surplus. The relative sizes of technology categories shown do not constitute a "ranking," since our sizing is not comprehensive. We do not quantify the split or transfer of surplus among or across companies or consumers, since this would depend on emerging competitive dynamics and business models. Moreover, the estimates are not directly additive, since some applications and/or value drivers are overlapping across technologies. Finally, they are not fully risk- or probability-adjusted.

It is one of the 3 most impactful technological advancements we will see before 2030, acc to McKinsey. By 2025, the IoT's economic impact will be around **$11.1 trillion - 14%** of today's global GDP

According to the Mckinsey's research

- Most current IoT projects can contribute to achieving both the SDGs and the UN's 2030 mission.
- Most of existing IoT deployments can address the SDGs.
- Most projects concentrate on these SDGs:
  - #7 Affordable and clean energy
  - #3 Good health and well-being
  - #9 Industry, innovation, and infrastructure
  - #11 Smart cities and communities
  - #12 Responsible production and consumption
  - #16 Peace Justice and strong institutions
  - #14 life below water
  - #6 clean water and sanitation

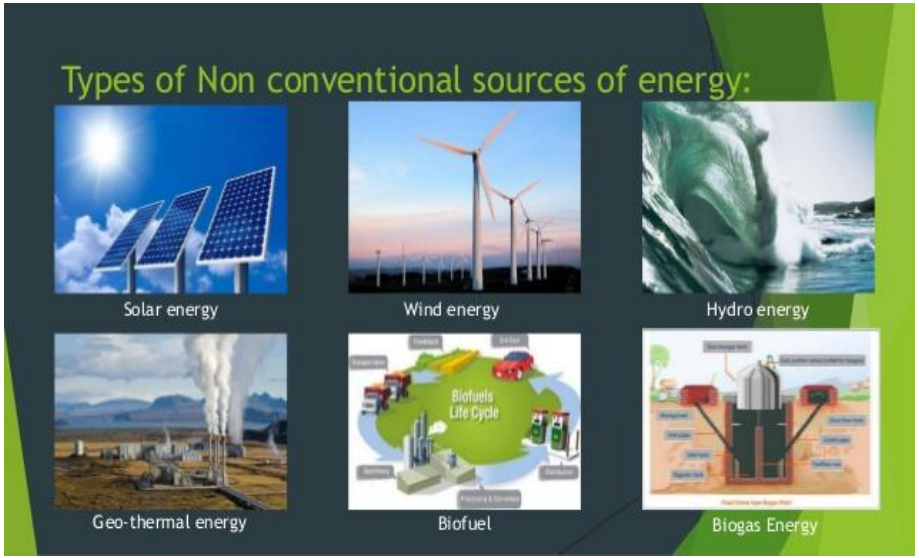
Affordable And Clean Energy

- SDG - 7

7 AFFORDABLE AND CLEAN ENERGY

About SDG - 7

- Ensure access to affordable, reliable, sustainable and modern energy for all



Challenges

Opportunities

Energy is critical and people with no sustainable access to energy are deprived of the opportunity to become part of national and global progress.

Access

One billion people around the world live without access to energy.

Technology

39% of the world's population, do not have access to clean fuels and technologies for cooking.

Use Cases of IOT

- Internet of Things is the enabler of the modern energy industry.
- **Control and automation** - Automate the management of wind farms, optimize maintenance, thus reduce the cost dramatically.
- **Availability** - Watttime system is a good example of an IoT solution that makes green energy available to everyone.
- **Cost - Efficiency** - Power consumption monitoring and control tools that eventually help them cut down on the use of electricity and save big money

Steps taken by Indian Government

- The government's National Solar Mission is playing an important role in the work towards renewable energy, and interventions in rural electrification.

- New ultra-mega power projects are moving India towards achieving universal energy access.

- Some of the government schemes that are taken are listed below.
  - Scheme to Support Promotion Of Biomass Based Cogeneration In Sugar Mills And Other Industries In The Country (Up To March 2020)

  - Programme on Energy from Urban, Industrial, Agricultural Wastes/ Residues and Municipal Solid Waste

Role of ICT

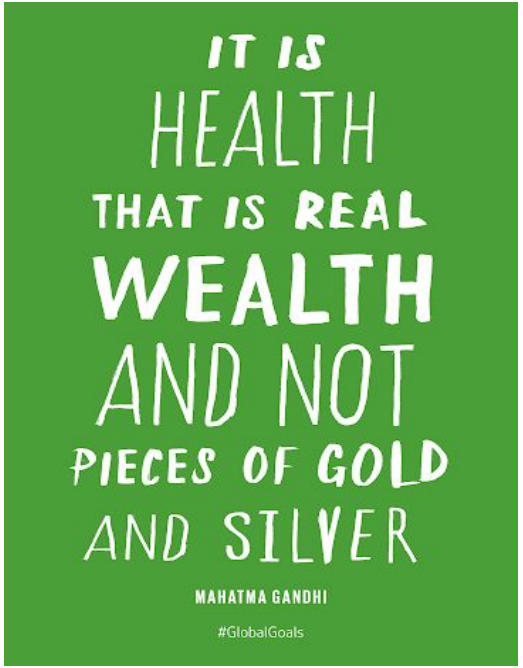
- ICT's can help accelerate progress towards each of the 17 SDGs.
- The International Telecommunication Union (ITU) is a specialized agency responsible for all matters related to ICT's.
- ITU strategy is to leverage the power of ICTs to accelerate progress on the SDGs
- It has helped develop greener ICTs and has outlined how smart grids can help to build more controllable and efficient energy systems and reduce carbon emissions.

Good Health And Well-Being

- SDG - 3

About SDG - 3

- Ensure healthy lives and promote well-being for all at all ages.



Challenges

Deaths

Despite global progress, an increasing proportion of child deaths occur in sub-Saharan Africa and Southern Asia.

Access

Universal affordable access to healthcare remains a challenge

Child Dispatchers

Over the years, significant strides have been made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality.

Use Cases of IOT

- The COVID-19 pandemic has been a pivot for exponential growth of IoT in healthcare.

- Telemedicine: From NASA's Mercury Program to COVID-19.
  - Telemedicine is an enabler in providing remote care especially in geographically remote areas.
  - The recent COVID-19 pandemic has shown the usefulness of telemedicine consultation in breaking the cycle of infection spread and easy access to consultation.

- Making Hospitals Smart-Management of Hospital Assets and Workflows.
  - Hospitals can be viewed as asset and information intensive organisations.

Steps taken by Indian Government

- The Indian government's National Health Mission prioritises national wellbeing and is leading change in this area

- India has made some progress in reducing its under-five mortality rate.

- Some of the government schemes that are taken are listed below.
  - Janani Shishu Suraksha Karyakram (JSSK)
  - Rashtriya Bal Swasthya Karyakram(RBSK)

Role of ICT

- Direct patient interaction, health informatics and telemedicine can be improved through better connectivity.

- In 2017, ITU and the World Health Organization launched the “Digital Health for Africa” partnership to scale up the use of digital technologies to strengthen the delivery of public health care services in Africa.

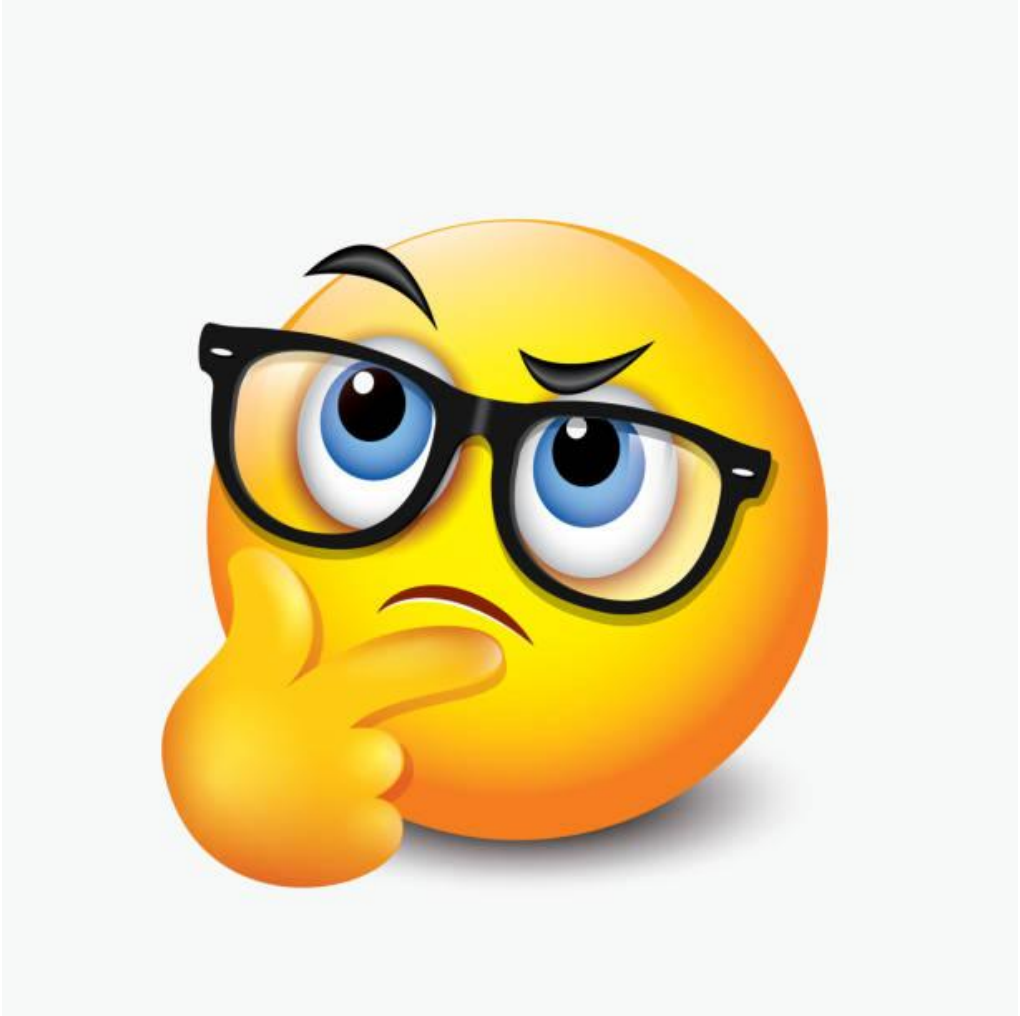
- ITU is also developing standards for multimedia systems to support the widespread deployment of e-health applications.

SUSTAINABLE DEVELOPMENT GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

SDG 9



WHY IOT HERE ?

SUSTAINABLE DEVELOPMENT GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALISATION, AND FOSTER INNOVATION

GLOBALLY

14.2%

OF THE WORLD'S WORKFORCE EMPLOYED IN MANUFACTURING

1.1 MANUFACTURING JOB CREATES 2.2 JOBS IN OTHER SECTORS

IN INDIA

111

MILLION

PEOPLE EMPLOYED IN MICRO, SMALL AND MEDIUM ENTERPRISES PRODUCE

33%

OF THE MANUFACTURING OUTPUT

GDP GROWTH AVERAGED

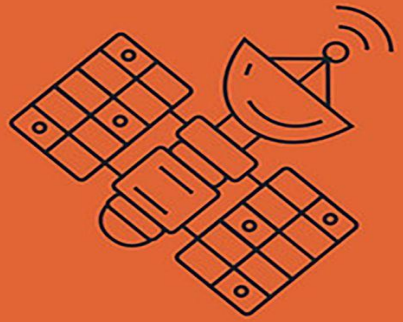
7.2%

BETWEEN 2018 - 2019

566

MILLION INTERNET SUBSCRIBERS (MOBILE AND LANDLINE)

1.80 MT ONE OF THE LOWEST PER CAPITA CO2 EMISSIONS IN THE WORLD



MANGALYAAN IS THE WORLD'S LEAST EXPENSIVE INTERPLANETARY MISSION TO MARS

Why we need IOT here ?

- Industry 4.0 gaining popularity
- Big data , data analytics and digital technology is going to play important role.
- To increase efficiency
- To improve quality of products and services
- To reduce cost

USE CASES

- Predictive maintenance : able to determine when piece of equipment will fail before it does.
- Smart metering
- Asset Tracking
- Fleet management : for companies relying on transportation

Indian Government Initiatives

- Government will fund exhibition space cost (up-to 80% funding) to 1000 Indian SMEs (Small and Micro Enterprises) who are well credit rated by National Small Industries Corporation/ MSME and, are contributing to IoT industry of India and need international exposure to promote their products at international exhibitions and for study tours, subject to a maximum of Rs.6 lakhs per Enterprise per year.
- Government will also fund (up-to 100%) IoT specific study tours by Industry Associations and supporting government organizations. 13 We recommend that government should support the above mentioned initiatives through programs owned by Ministry of MSME.

Indian Government Initiatives

- The Centre of Excellence (CoE) for Internet of Things (CoE-IoT) will host IoT incubation infrastructure to support start-ups, SMEs, students and other innovators based on membership and support from design to prototype in productizing their ideas.
- The CoE-IoT will be set up in major cities for Internet of Things innovation housing hardware design tools, wireless development kits, application sensors, software tools, training on specific technologies, industry interface etc. that otherwise would be difficult to afford for the start-ups, democratizing the innovation process.
- The industry liaisoning will be the responsibility of an industry partner NASSCOM, while ERNET will provide the academic interfacing.

Challenges

- Interoperability
- Reliability
- Security
- Network Performance
- Scalability
- Management

Role of ICT

SDG 9

- Infrastructure is controlled, managed and optimized by ICTs
- making cities smarter and more sustainable to improve quality of life
- increase in productivity , highly depends on the effective use of ICTs


GOAL
11
#SDGs
SUSTAINABLE CITIES
AND COMMUNITIES
Make cities and human settlements inclusive, safe,
resilient and sustainable

SDG 11

Challenges

Challenge 1

By 2030,

1) More than 4.2 billion people lives in cities.
2) 43 megacities with each more than 10 million inhabitants.

Challenge 2

By 2030,

1) 60-80% all energy Consumption.
2) 75% of planet's carbon emissions.

Challenge 3

1) experiencing congestion, a lack of basic services, a shortage of adequate housing, and declining infrastructure

Why is this Important ?

SDG 11

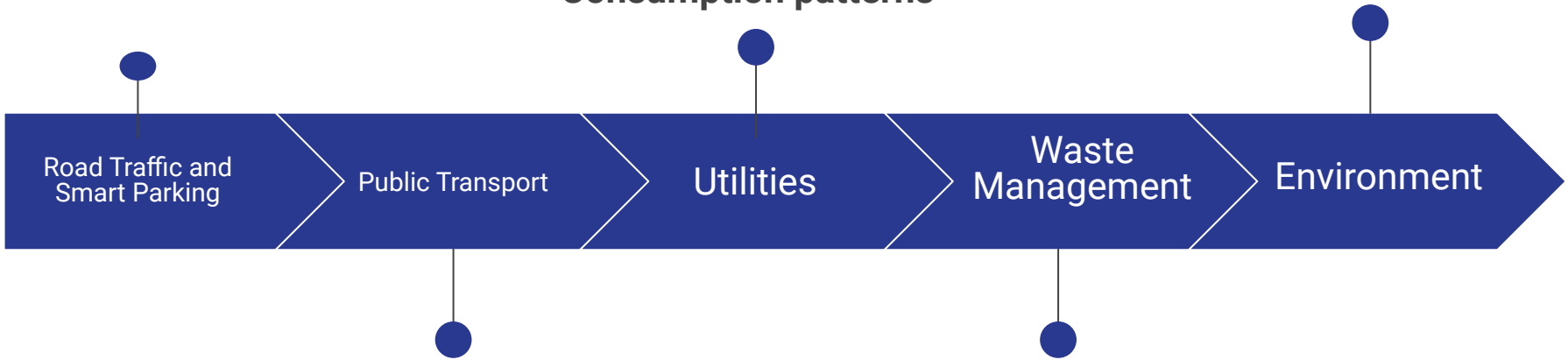
- Cities are engines for sustainable development.
- Opportunities for people in urban spaces.
- Urban areas emmits lot of greenhouse gases and contribute to climate change.

IoT Use cases for Smart Cities

Sensors-fetch GPS data,Smart Traffic lights(Cloud),Closed Circuit Television cameras.

Smart meters and Billing, Revealing Consumption patterns

Network of Sensors along busy roads and around plants to check air quality.



Retrieve data from IoT sensors to enhance travelling experience.

Each waste container gets a sensor that gathers the data about the level of the waste in a container.

Indian Government Initiatives

Smarts Cities Mission

- Launched on 25th june 2015 by hon' prime minister.
- 100 cities have been selected for developing as smart cities.
- Participation of private sector through Public private partnerships.

Awas Yojana

- Launched on 25th june 2015 by hon' prime minister.
- to provide housing for all in urban areas by year 2022.

AMRUT Scheme

- To ensure a proper supply of water and a sewage connection in every household.
- Latest developments includes sewage treatment plans(STPS),Online building permission system.

Role of ICT

SGD 11

- ICT has a crucial role in sustainable smart cities.
- ICT-enabled information and knowledge sharing.
- ICT-enabled forecasts.
- ICT-enabled integration.

Responsible Consumption and Production

- 12 SDG

What does SDG-12 do?

- use of natural resources
- food waste reduction through prevention
- reduction , recycling and reuse
- environmentally sound management of chemicals

Challenges deep-dive

Globally

- By 2050 , if population becomes 9.6 billion(approx),an equivalent of 3 planets will be required to sustain current life style
- Energy use doubled since 2000.
- 1/3rd of food produced is wasted.
- energy use in OECD countries will increase a further 35% by 2020.

India

- 3rd largest Green House Emitter responsible for 6.9% of global emissions.
- Only 19.9% of urban Indian’s waste is processed.

Indian Government Initiatives

- In year 2015 , india decided to reduce emission intensity

20-25 % by 2020

33-35% by 2030

- The government formally ratified the historic Paris Agreement.

On 2nd October 2016

- The National Policy On Biofuels and National Clean Energy Fund are some of government flagship schemes.

Use cases of IoT

1. **Monitoring of climate conditions :** allMETEO, Smart Elements, and Pycno.
2. **Greenhouse automation :** Farmapp ,Growlink and GreenIQ.
3. **Crop management :** Arable and Semios
4. **Cattle monitoring and management :** SCR by Allflex and Cowlar
5. **Precision farming :** CropX
6. **Agricultural drones :** SoilScout
7. **Predictive analytics for smart farming :** FarmLogs and Cropio.

IoT shaping agriculture

1. Data, tons of data, collected by smart agriculture sensors
2. Better control over the internal processes and, as a result, lower production risks
3. Cost management and waste reduction thanks to the increased control over the production.
4. Increased business efficiency through process automation.
5. Enhanced product quality and volumes

Govt sponsered schemes

- Daily Enterpreneurship Developement scheme
- Commercial production units for govt inputs.
- National livestock mission
- Intrest subvention scheme
- GSS- Ensuring end used of subsidy released.

Role of ICT

- Improves product specific improvements
- Increased Dematerialization
- Virtualisation
- Smart technologies
- Cloud computing , smart grids,smart metering, and reduced energy consumption has an impact on reducing the consumption.

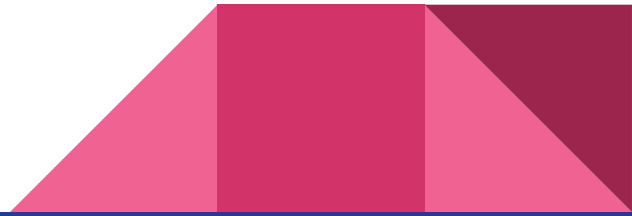
Peace, Justice and Strong Institutions

- 16 SDG

IoT in India’s Defence Sector

Why we need IoT in defense sector?

- Gather Battlefield awareness
- Proactive health surveillance
- Augmented Reality Remote Training
- and many more



According to the Indian IoT Magazine,Two startups are making remarkable progress in IoT based solutions in defence sector

1. Tonbo Imaging
2. CRON Systems

Tonbo Imaging

- Tonbo specializes in imaging technology, especially thermal imaging, which provides enhanced vision in low-light conditions using heat signatures.
- Tonbo Imaging partners with Indian Military
- Indian armed forces also ordered drone systems having Tonbo optical systems on board.

Tonbo Imaging

- Tonbo also makes driver vision systems for self-driving cars.
- Indian CRPF, NSG, and the Army Northern Command the prominent clients that firm deals with.
- Tonbo recently forwarded its advanced vision system products for the Indian Army’s Arjun battle tanks.

CRON System

CRON Systems is an IoT based startup, Expertise surrounding deep research in lasers, artificial intelligence, encrypted communications and automation.

Laser walls, Surveillance drones, command and control dashboard connected with encrypted communication network are some of CRON’s key enterprise offerings.

CRON System

CRON is currently working on a driverless truck, Which can be used by the army to fetch troops back after a surgical strike.

CRON announced an exclusive technology agreement with an Israeli defense robotics company, Automotive Robotic Industry Ltd(ARI).

Challenges

Cyber Attack

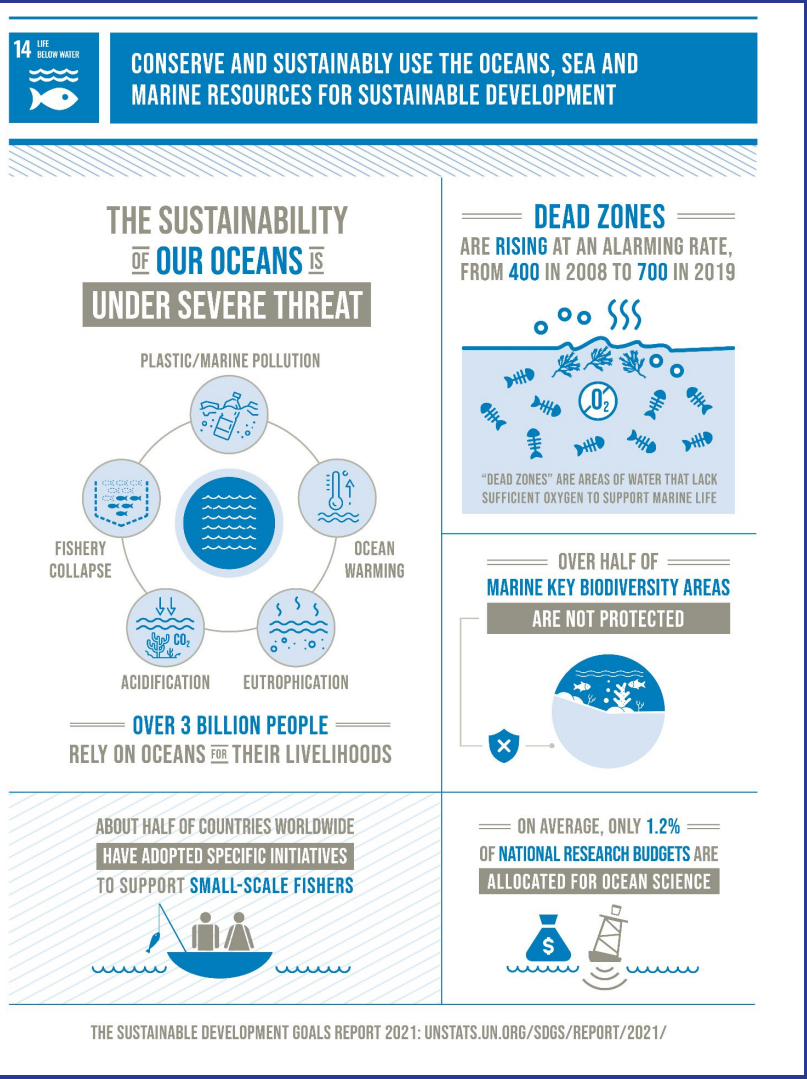
- The largest drawback of IoT technology is the serious risks in data security.

Lack of Physical Hardening

- IoT devices need to be more secured physically from threats.

Life Below Water

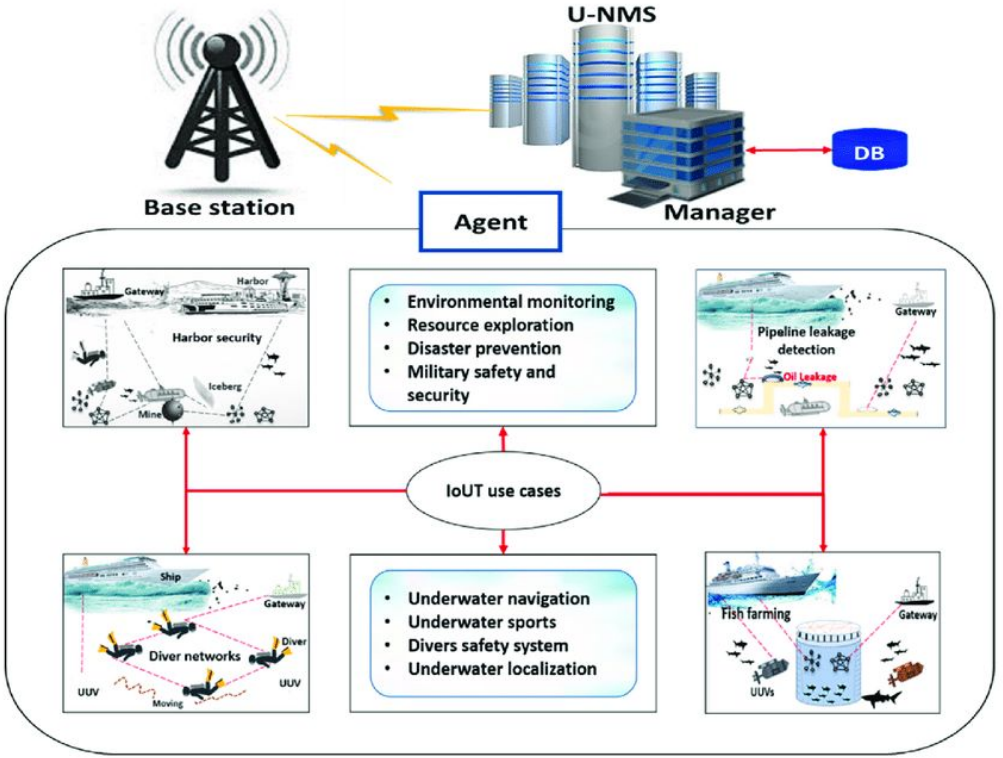
- 14 SDG



IoUT - Internet of Underwater Things

➢ IoUT use cases & applications in SDG

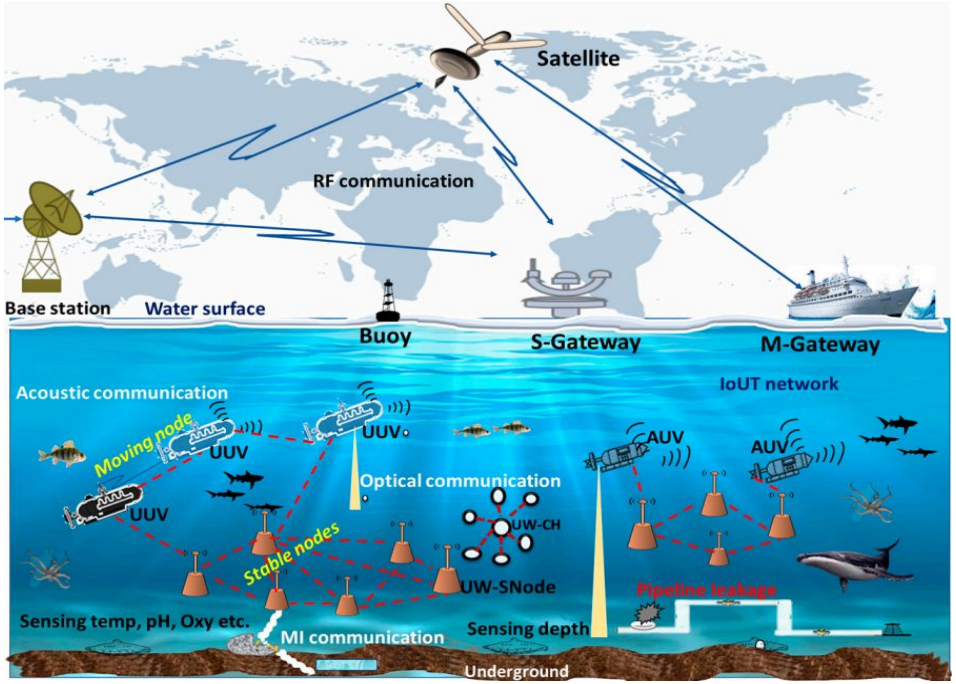
- underwater exploration
- disaster prevention
- environmental monitoring
- real-time aquatic education
- military
- archaeological expeditions



IoUT - Internet of Underwater Things

➢ IoUT Devices and Projects

- Autonomous Underwater Vehicles (AUV)
- SUNRISE project by EU (Video)



IoUT - Internet of Underwater Things

➢ Challenges for IoUT

- Signal Transmission
- Signal Interference
- Reliability
- Cost
- Chemical and UV radiation resistance

Clean Water and Sanitation

- 6 SDG

Why do we even need IoT here?

- ➔ Population Growth
  - ◆ According to a report by Mckinsey, by 2050 the population in urban areas is going to grow by three fold.
- ➔ Climate Change
  - ◆ Rising Temperatures
  - ◆ Volcanic Eruptions
- ➔ Natural Calamities
  - ◆ Around 74% of the calamities from 2001 to 2021 were water-related.
  - ◆ Contamination of fresh water resources.

❖ Above reasons force the promotion of intelligent and smart based systems to monitor, analyse and mitigate the water scarcity.

Use cases - deep-dive

Smart Water Meters

- Real time Monitoring
  - Flow
  - Pressure
  - Quality
- Collecting Data
- Analysis of the data in cloud using cloud IoT Analytics
- Based on the analytics, display it to users.

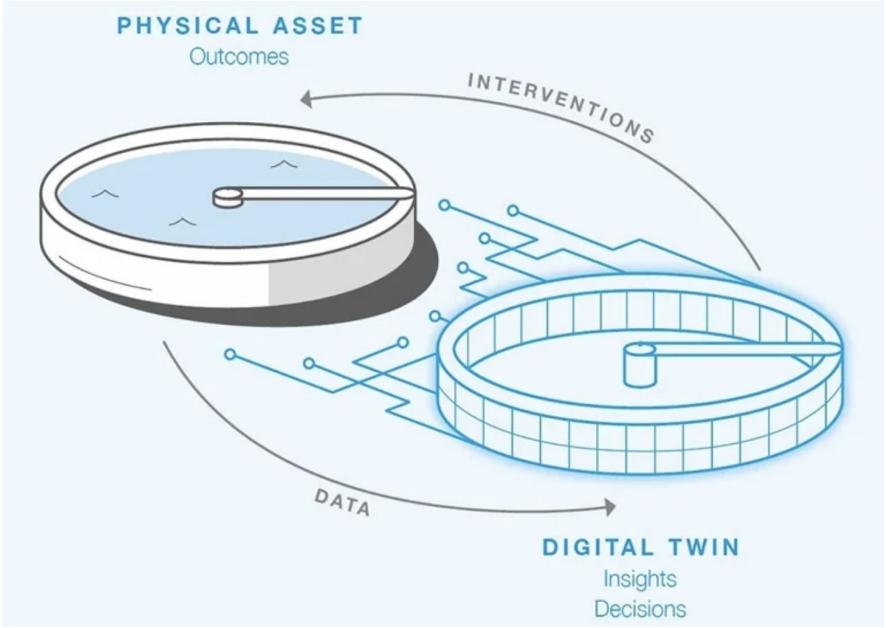
Smart Wastewater Treatment

- Cities
- Prevention of sewage overflows
- Real time Information of water level, quality.
- Based on Predefined threshold values, alerts will be sent to the governing authorities.

Use cases - deep-dive

Digital Twin

- ➔ Digital Model of the Infrastructure.
- ➔ Integration of real time data collected by IoT devices.
- ➔ Simulation of the digital infrastructure model by leveraging the predictive analysis done by AI/ML models.
- ➔ Example:- Digital Twin of Sewer management system helps to predict when overflows may be imminent.



Indian Government Initiative

Jal Jeevan Mission (JJM)

Ref : https://jaljeevanmission.gov.in/

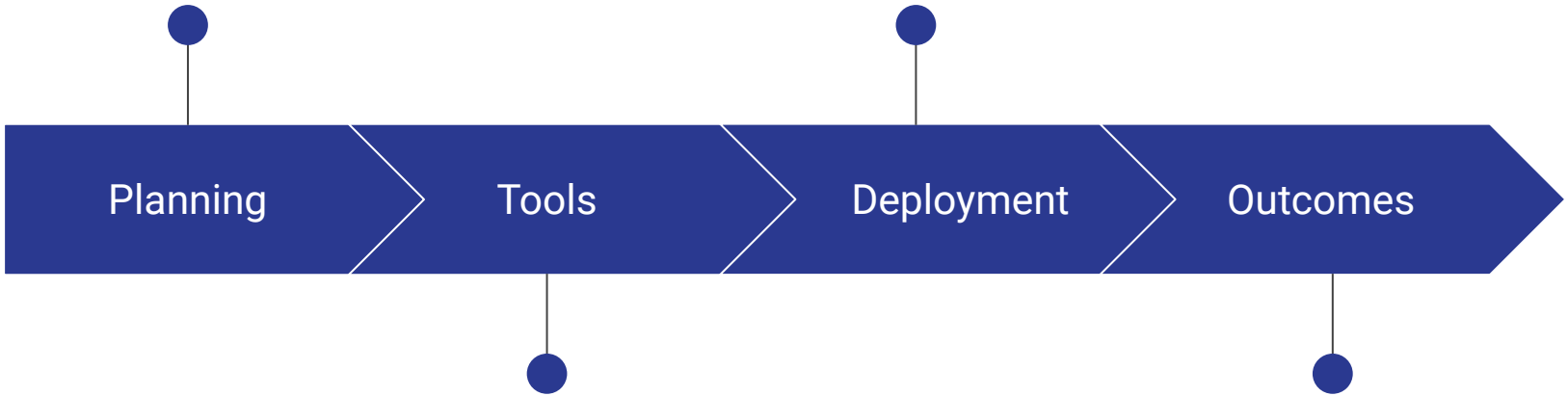
- An Initiative by Ministry of Jal Shakti in 2019.
- It’s a Union Government's flagship programme, which is implemented in partnership with States/ UTs to provide tap water connection to every rural household by 2024.
- Envisions to create a Digital Wall and Remote Command & Control Centre for monitoring.
- To supply quality water in adequate quantity (55 LPCD) every day.

Jal Jeevan Mission - Objective

- Use of (IoT) based remote monitoring that provides near real-time information without any manual intervention by using sensors.
- The collected/generated data is used to effectively monitor and manage the resources.
- Ensure real time visibility to State water supply/ PHED officials, and citizens.
- Futuristic vision to ensure regular tap water to every home.
- Enormous gains in terms of operational efficiencies, cost reduction, grievance redressal, etc.
- Data will drive improvement in service delivery and instil transparency.

Collaboration with TCIT, Tata Trust to implement pilots which had sturdy sensors.

Pilots were deployed in september 2020.



flow meters, ground water level sensors, chlorine analyzers

Distribution issues – such as outages, leakages, low pressure, etc. alerted both officials and community regarding fast depleting groundwater levels

Jal Jeevan Mission - Challenges

- Need of a Robust Solution at a fraction of the water infrastructure costs.
- CoVid-19 pandemic
- Different sensor designs were required, as the project aimed to implement the system across different terrains such as western Himalayas, Gangetic Plains, Desserts region, etc.
- Connectivity issues for IoT in rural India.
- Use of LPWAN(Low Power Wide Area Network).

A small demo :- https://ejalshakti.gov.in/jjmreport/IoTMonitoring.aspx

Role of ICT

- Introduction of IoT Technology.
- It has boosted Government’s Atma Nirbhar Bharat programme.
- Network of sensors used to collect data.
- Integration of Data with GIS(Geographical Information System).
- Monitoring and analysis using state of the art tools such as Microsoft’s Power BI.
- Further Automation is being done by integrating the analytical tools with intelligent alert systems such CAP.

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Got Any Questions?